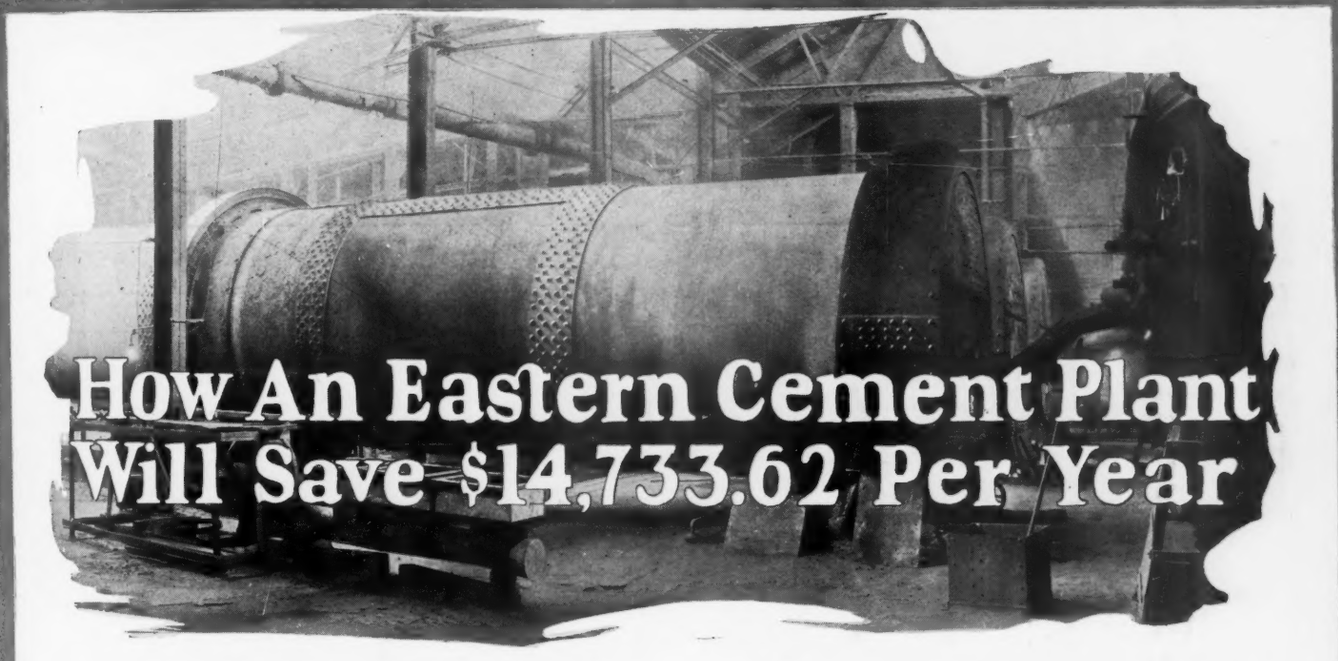
JUN 3 1926

Rock Products

With which is Incorporated **CEMENT and ENGINEERING NEWS** Founded 1896

Chicago, May 29, 1926 (*Issued Every Other Week*) Volume XXIX, No. 11



How An Eastern Cement Plant Will Save $14,733.62 Per Year

IN a prominent eastern cement plant, when using ordinary (high grade) fire clay brick, the average life of hot zone linings was 4 months; hood linings 3½ months.

Since this company has been using ARCOFRAX, a special high Alumina brick, in its hot zones and hoods

—ARCOFRAX hot zone lining in No. 4 Kiln ran 23½ months; five other ARCOFRAX hot zone linings have already run over 14 months and their present condition is such as to indicate that the run on No. 4 Kiln was not exceptional.
—ARCOFRAX-lined hoods in seven kilns show an average life of 11 months.
—Relining costs have been reduced 67%.
—Lost production time has been decreased 73%.

By eliminating shut-downs, reducing lining costs, decreasing lost production time and saving coal required for heating up after frequent relinings, ARCOFRAX high Alumina brick is saving this cement company $14,733.62 per year.

These figures are taken from a verified survey made by an independent engineering organization. We shall be glad to send a complete copy of this survey, with its detailed figures of relining costs and production gains, to any cement executive interested in longer-lived linings and lower refractory costs.

GENERAL REFRACTORIES COMPANY

117 South 16th Street, Philadelphia, Pa.

District Offices—Boston Buffalo Chicago Cleveland Detroit Indianapolis New York Pittsburgh
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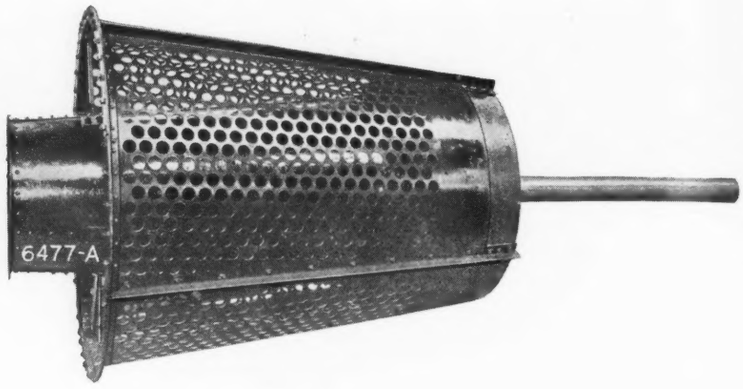
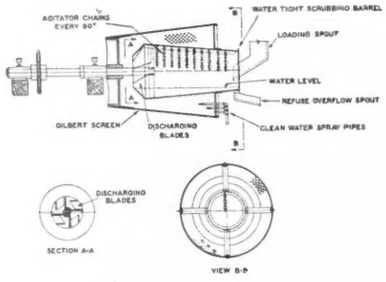


THE COLUMBIA SCREEN and SCRUBBER

Built by S-A Engineers

Pat. App. For



This ingenious new combination brought out by the S-A Engineers is the most successful equipment at present for scrubbing aggregate and for making one separation. It consists of a scrubbing barrel inside the already popular Gilbert Screen. Material is delivered to the inside of the water-tight scrubber-barrel where short lengths of chains fastened at 90 degree intervals agitate the material and with the water, loosen and remove the dirt.

When the material reaches the end of the tube, fixed blades discharge the aggregate to the inside of the Gilbert Screen for final washing and the first separation.

STEPHENS-ADAMSON MFG. CO.

Aurora, Illinois, and
Los Angeles

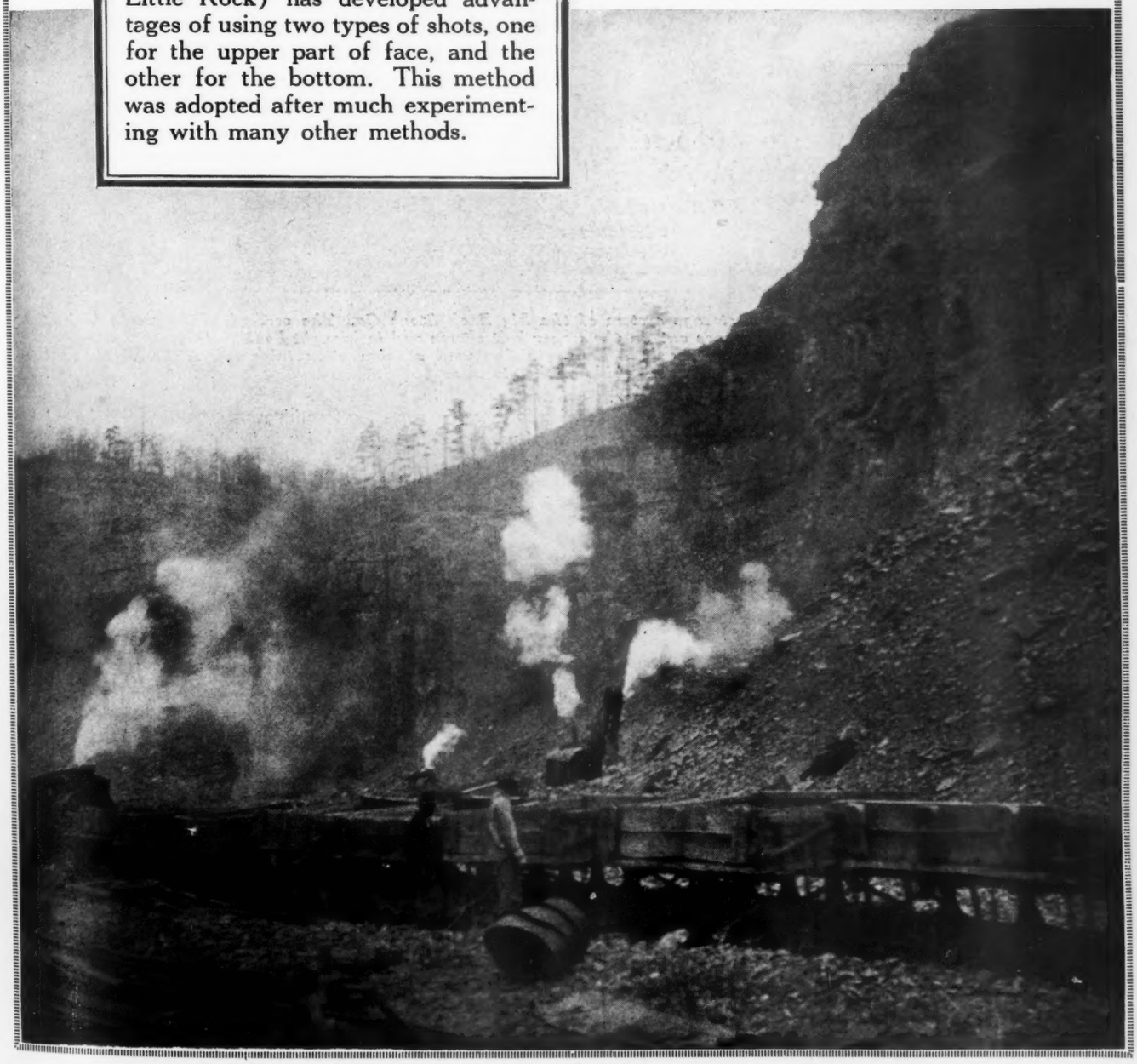
1926 25th
STEPHENS-ADAMSON
ANNIVERSARY

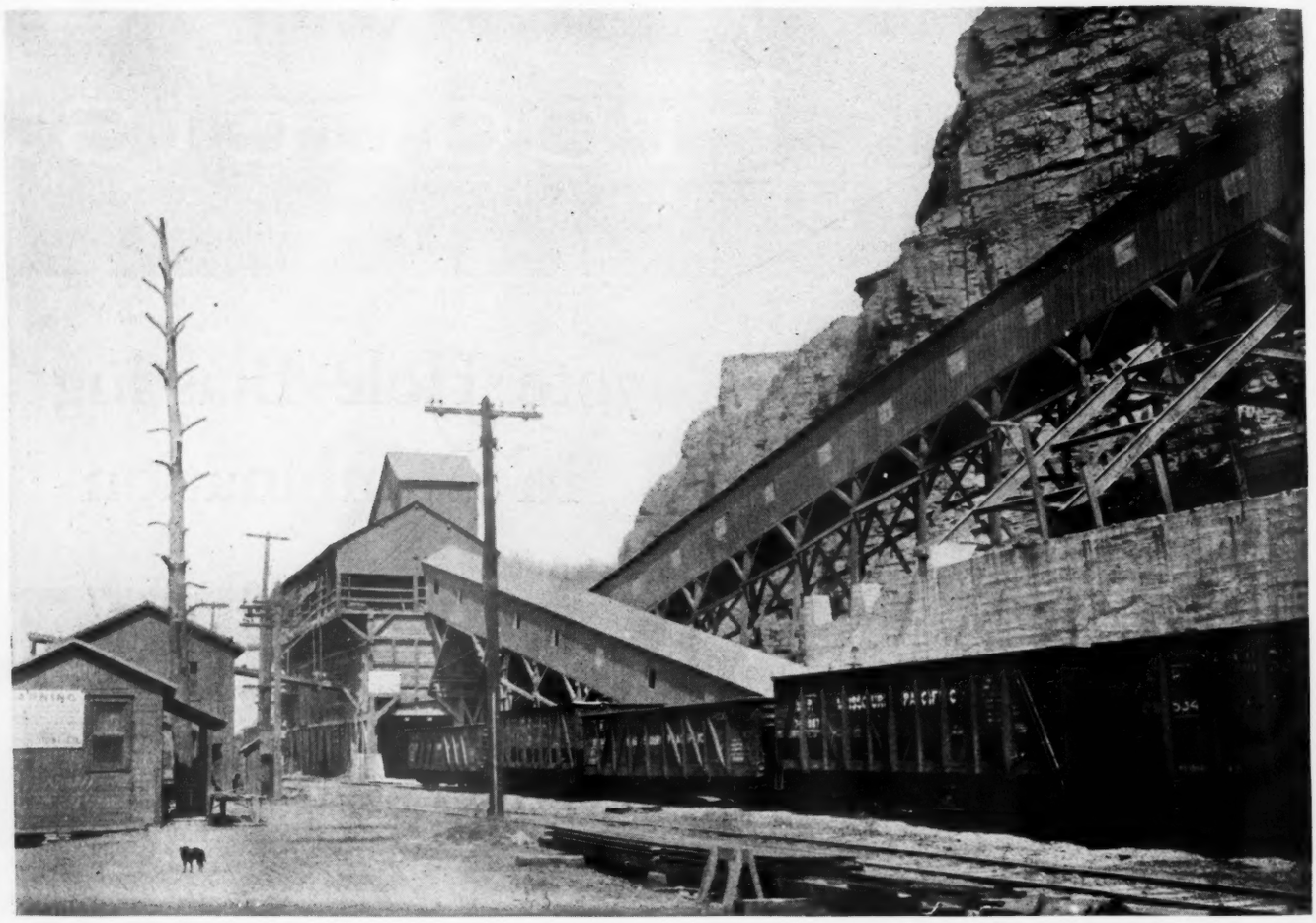
Volume XXIX Chicago, May 29, 1926 Number 11

Rock Products
CEMENT and ENGINEERING NEWS

Well Drill and Coyote Hole Blasting in Combination

Experience in veteran Arkansas quarry (the Big Rock Stone Co. of Little Rock) has developed advantages of using two types of shots, one for the upper part of face, and the other for the bottom. This method was adopted after much experimenting with many other methods.





Crushing plant and part of the splendid storage system of the Big Rock Stone Co. The screening equipment is in the house above the bins. Stone for storage goes out on the upper belt shown and is brought back to the bins by the lower belt. This runs under the pile in a concrete tunnel. A long retaining wall of concrete retains the stored stone on the track side of the storage

THE Big Rock Stone Co. of Little Rock, Ark., operates a quarry and crushing plant about five miles from the city. The plant is a veteran among stone crushing plants for it has been in operation for 30 years. Of course there have been changes but they have not been so radical as to destroy the original design and the original crushers are still in operation. It is an excellent example of how a well-designed and well-built plant can stand up to its work. After its 30 years of continuous working the plant looks ready for another long period of service. A plant with such a record is not only worth recording but worth studying in detail.

Rock Called Trap or Granite but Really a Quartzite

The rock which is quarried is a quartzite, Locally it is spoken of as trap and sometimes as granite, the first name being given to it because it is as dark in color as some traps, Pennsylvania diabase, for example, and the second because its texture is like that of granite. However, it is unquestionably a sedimentary rock and the Geological Survey says it is a quartzite. The strata are horizontal and there are occasional seams of very hard slate. This is so hard that there is no objection to its inclusion in concrete aggregate, which is the principal use to which the crushed rock is put.

The face is over half a mile long and the height varies considerably. Where the present workings are carried on it is 250 ft. The variation in height comes from the errosion of the upper part of the deposit. It lies along the Arkansas River and water channels have been cut into it for some depth in places. Originally the face was almost at the river but in the thirty years of working it has been cut back several hundred feet.

Entrance to one of the coyote holes which are used in working the lower part of the quarry

A Unique Method of Quarrying

The method of quarrying is peculiar and so far as the writer knows it is unique. At least no record of such practice elsewhere has come to his attention. It is a combination of well drilling and the use of the T-shaped tunnels, which are used so much in the western states and called "coyote holes." The upper part of the face is shot down with well drill holes and the bottom shot out with coyote holes.

The well drill holes, spaced about 20x20 ft. are put down to a depth of 160 ft. One Sanderson-cyclone and one Armstrong drill are employed. As this rock is very hard, 10 ft. is a fair day's run, although occasionally 12 or even 15 ft. is made. Holes are loaded with Illinois Powder Co.'s "Gold Medal" powder. These well drill holes are shot first and after the steam shovel has

cleaned up the rock that they have brought down the coyote holes are loaded and shot. The coyote holes go in 35 ft. and at the end branch out 10 ft. on both sides. They are loaded with the same dynamite powder as the drill holes. Black powder has been tried but it was not so successful as dynamite.

This combination method of quarrying was not adopted until other methods had been thoroughly tried out. Straight well drill holes did not break down the rock well enough and left toes that had to be drilled out. One straight coyote hole was tried with 36,000 lbs. of powder and hardly any rock of a size that could be handled was recovered from it. The combination method has given much better results than either method by itself and moreover there is less complaint of blasting shocks from householders nearby since it was adopted.

Little Pop Shooting Required

Working in this way very little pop shooting is required, as most of the rock is broken to a size that the steam shovels and the primary crusher can handle. Colored laborers are largely employed in the quarry and many of these are very skillful in working high up on the face, drilling the larger pieces of rock that may be left and starting runs so that the broken rock may flow down to the shovels.

Steam Shovels Have a Long Life

Two 70-ton Bucyrus shovels are in use and these have given remarkably long service. One is 18 and the other 17 years old. Of course, as Mr. Hurley, the quarry superintendent pointed out, there is not so much left of the original shovels, for practically everything about them that could be renewed has been renewed, nevertheless, they have been kept in service for all these years and are still in excellent condition and able to keep up with the demand of the plant.

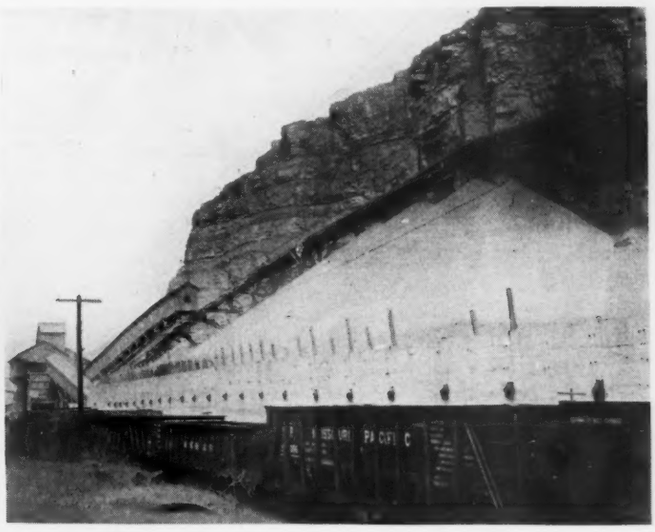
The shovels load into Western side dump cars and these are drawn in trains to the plant by 18-ton Porter steam dinkeys. The cars are dropped at the plant track by the dinkey and are pulled in to the primary crusher by an Allis-Chalmers single drum friction hoist.

This primary crusher is a No. 9. Just beyond it are two No. 7½ crushers set *en echelon* which form one unit and beyond this are four crushers, two No. 5 and two No. 3, set on the corners of a square. Thus all the crushers are at the ground level and all of them can be looked after by one man, although helpers do the actual feeding of the primary crusher.

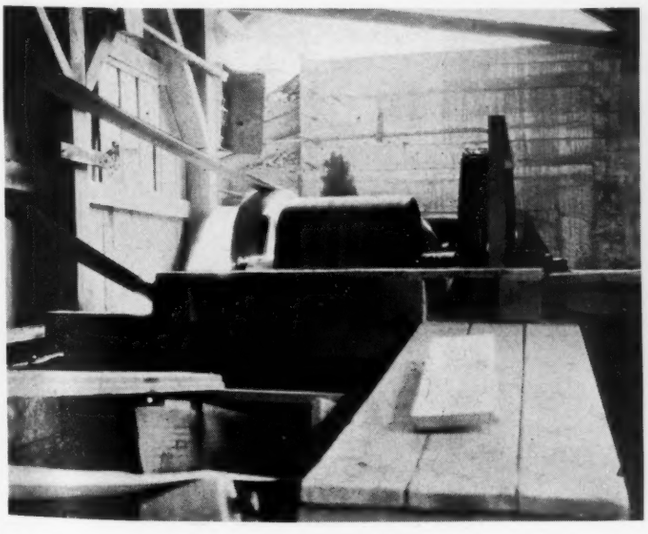
The Screening Department

After passing the primary crusher the rock goes to a 42-in. bucket and belt elevator which lifts it to an 18-ft. scalping screen of 60-in. diameter. This has 3-in. round holes. The oversize goes to the two No. 7½ crushers and the undersize to a 36-in. bucket and belt elevator which also takes the discharge of the No. 7½ crushers. This elevator discharges into the two main sizing

Looking out on the storage pile from the screening department above the bins



The extension storage belt is hung from the face of the cliff



The belt which brings stone from storage where it emerges from the tunnel

Close-up of the extension belt and suspending cables. Brackets hold it on the face of the cliff

screens which are 24 ft. long and of 48-in. diameter for the main section. The oversize of this elevator is sent to bin as No. 1 if this is desired. If not it goes to the four crushers mentioned and the discharge of these is re-elevated to the same screens. An intermediate size is sent to bins and the finer sizes, from 1¼ in. down are sent to four Austin double shaking screens. These make three products, all of which go to bins. These screens are run by a 50 h.p. motor. The remaining machinery of the plant is run by a 400 h.p. motor.

The sizes made are No. 1, which is between 3-in. and 2-in., No. 3, which is between 2-in. and 1¼-in., "chats" from ½-in. to ¼-in. and screenings, from ¼-in. down.

The Well Designed Storage System

The plant has a splendid storage system to which the product is sent as soon as the bins are filled. The product is sent to storage by a belt 24-in. wide with 300 ft. centers. This discharges on a second belt 450 ft. long, but which is lengthened or shortened according to need. It is called the extension belt. This belt is carried above the storage piles in part by steel bents, in part by hanging from the walls with wire cables and in part by brackets. In spite of this unusual combination of supporting methods it runs well and keeps in line. There is a tripper on this belt for discharging at intermediate points. The recovery from storage is by two 30-in. belts one of which is 450 ft. long and lies in a tunnel under the pile. This tunnel is very solidly built of reinforced concrete, and is amply large, being 7 ft. high and 7 ft. wide on the inside. It is well lighted throughout with electric lights and provided with plenty of gates and chutes to take the stone from the piles above. The belt from the tunnel discharges on a second belt 250 ft. long which takes the recovered stone to the bin for loading. There is also a 30-in. conveyor which runs from this bin to the four small crushers, so that any surplus large stone in the storage plant may be re-crushed when necessary.

The peculiar system of quarrying breaks the hard rock into sizes easily handled by the steam shovel

Except for the belt these conveyors were built in the company's own machine shops, the rollers and other parts being bought as rough castings. Grease cup lubrication is used throughout. The belts with the exception of the extension belt are all in covered galleries to protect them from the sun and rain.

The ordinary output of the plant is 2000 tons per day. A great deal of this has gone into concrete road construction. In addition to the regular crushed stone production

A close-up of the bins and screen house. The crushers are on the ground level behind the bins

L. N. Patten (left) and G. W. Hurley, plant and quarry superintendents

there is a considerable loading of one-man stone for rip-rap at certain seasons of the year. This is hand loaded at the quarry face and brought down to a special loading track.

No stripping was being done when the plant was visited. When ground has to be stripped it is done by contract and the contractor furnishes his own shovel and other equipment.

The offices of the Big Rock Stone Co. are at 111 Center street, Little Rock. W. W. Dickinson is president of the company and Ben Dickinson is manager. G. W. Hurley is quarry superintendent and L. N. Patten is crushing plant superintendent. The plant was mainly designed by Allis-Chalmers engineers and the Allis-Chalmers Company furnished the machinery including the motors, except that which has been mentioned as of another make.

Ontario Gypsum Company Interested in British Columbia Deposits

A MOVEMENT that indicates the possibility of an early development of the large gypsum deposits between Lytton and Ashcroft is seen in the opening of an office in Vancouver of the Ontario Gypsum Co., Ltd., which has its head office in Paris, Ontario.

This is the largest gypsum company operating in Canada, and it has already developed, or is in process of developing gypsum beds in all the other provinces outside of British Columbia.

Recently the management of the company made an investigation into the extent of the known deposits in British Columbia and arrived at the conclusion that the time was coming, in view of the company's export business to the Orient, when there would have to be established a manufacturing plant on the Pacific coast.

Repair shop for cars and locomotives and track for loading rip-rap stone (at the right) at plant of Big Rock Stone Co.

Crushed Stone for Filter Beds

By CHARLES H. McALISTER
Of Supply Distributors Corporation, Cleveland, Ohio

OF interest, nationally, to commercial crushed stone producers is the recognition by prominent engineers, of the value of well prepared crushed stone of proper quality as a medium for trickling filters in sewage disposal plants.

The prospects of finding an outlet for thousands of tons of crushed stone when such has the required physical properties and is carefully prepared, is brought directly to the attention of commercial stone producers by the action of the city of Akron, Ohio, in awarding one of the Ohio producers direct, a contract for 305,000 tons of stone to be used as a medium of filtration in the trickling filters of the new sewage disposal plant to be immediately constructed at Botzum, north of the Akron city limits.

Action in awarding the contract was taken after careful inspection and tests by competent engineers, at the direction of city officials, and some quarries inspected failed of approval because of the variable qualities of toughness and soundness.

Having in mind a probable requirement, by the city of Cleveland and the city of Akron, as well as other Ohio communities, for a suitable material for a filtering medium in trickling filters, and knowing of the general use of sound hard crushed stone as such, a few of the larger commercial crushed stone producers of Ohio, nearly a year ago, in attempting to find how well Ohio limestone would serve as an alternate to the eastern traps, for a filtering media, decided to have samples of their various quarries taken by an engineer of recognized standing, and thoroughly tested, particularly for soundness. These tests were intended to inform each producer with that which was fit or unfit. The samples were subjected to actual freezing and thawing, as well as to sodium sulphate tests, both running concurrently. Tests to determine the toughness, hardness, per cent of absorption and cementing quality were applied to the samples selected at the quarries by an accredited representative of the engineer, and the results of these tests will be given for the benefit of all concerned as soon as the report is completed.

How the Filter Works

A trickling filter (called also a sprinkling or percolating filter) is an enclosure, with earth, stone or concrete walls, filled with pieces of carefully sized material called the filtering medium, overlying a system of collector pipes, or underdrains.

The sewage, after being settled to remove suspended matter, is intermittently sprayed, usually by means of automatically regulated sprays, evenly over the surface of the filter.

The applied liquid sewage trickles down through the bed, coming in contact with jelly-like films on the surfaces of the pieces of filtering medium where putrefactive organic matter is converted into a non-putrefactive condition by the innumerable bacteria and biological organisms present in the film. Under proper operating conditions, the sewage is discharged from the underdrain system well nitrified and stable.

For efficient results the beds must be well aerated. During cold weather, when bacteria are somewhat inactive, solid non-putrefactive matter accumulates within the filter but with the advent of warm weather, the activities of the bacteria increase and this stored matter becomes loosened and ordinarily sloughs off and passes out through the underdrains, thus maintaining the voids or air spaces in the filter.

In northern climates operation during the winter results in alternate freezing and thawing which necessitates the exclusive use of sound material, and in view of the preceding, it is obvious that the success of a trickling filter is largely dependent upon the physical properties, as well as the careful sizing, of the filtering medium.

A material which would disintegrate from any cause would tend to fill the voids and cause clogging. It should also be free from dust or other substances which would tend toward cutting down the voids. Furthermore, the surface of the material should be neither too rough nor too smooth. It should be such that the bacterial films will adhere to the individual particles and yet should not provide anchorage, through excessive roughness, pits, etc., to prevent the sloughing off and passing out of the solid matter stored through the period of bacterial inactivity.

Only New England Gravel Producer Using a Ladder Dredge

Operations of the Scully Company, of Cambridge, Mass.

NOTWITHSTANDING that there are some 50 dealers in sand and gravel in and around Boston, Mass., the bulk of the business is in the hands of a few strong companies. One of the most important of these is the Scully Co., which has its office and yards at 118 First street, Cambridge, on the bank of the Charles river and near one of the large bridges that connect Cambridge with Boston. It is one of the oldest companies in the United States, for it was established in 1865, although it was not incorporated until a later date.

Among the New England sand and gravel producing companies it is notable because it has the only ladder dredge in that part of the country. So far as could be learned, this is the only dredge of its type on the Atlantic coast north of the Delaware. It was built by the Ellicott Machine Corp. of Baltimore, which has built a number of dredges of this type for use in other waters and it has been a very successful installation. It made a record in 1925 of 11 months straight running time with the loss of only one day.

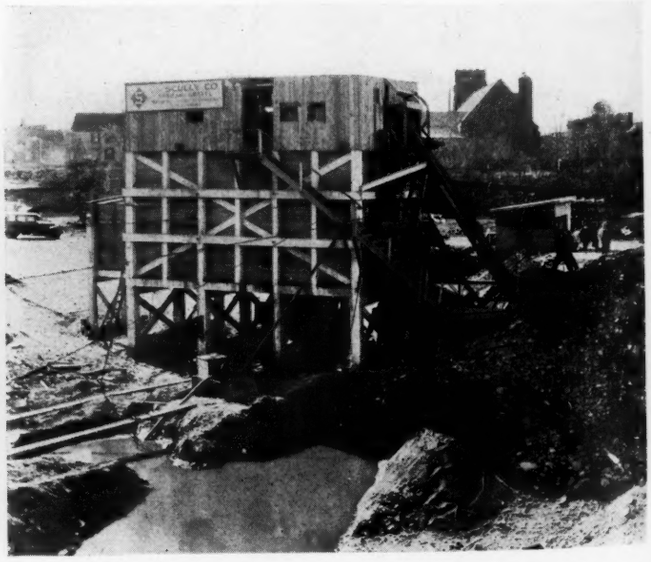
Like the dredges of this type which are so much used on the Ohio and the Potomac, the dredge is equipped with washing and screening machinery to turn out finished products. Two sizes of gravel and two of sand are made and loaded into barges as they are made. The ladder has ⅓-yd. buckets and digs steadily at the rate of 200 tons per hour.

The crane can reach almost any part of the yard

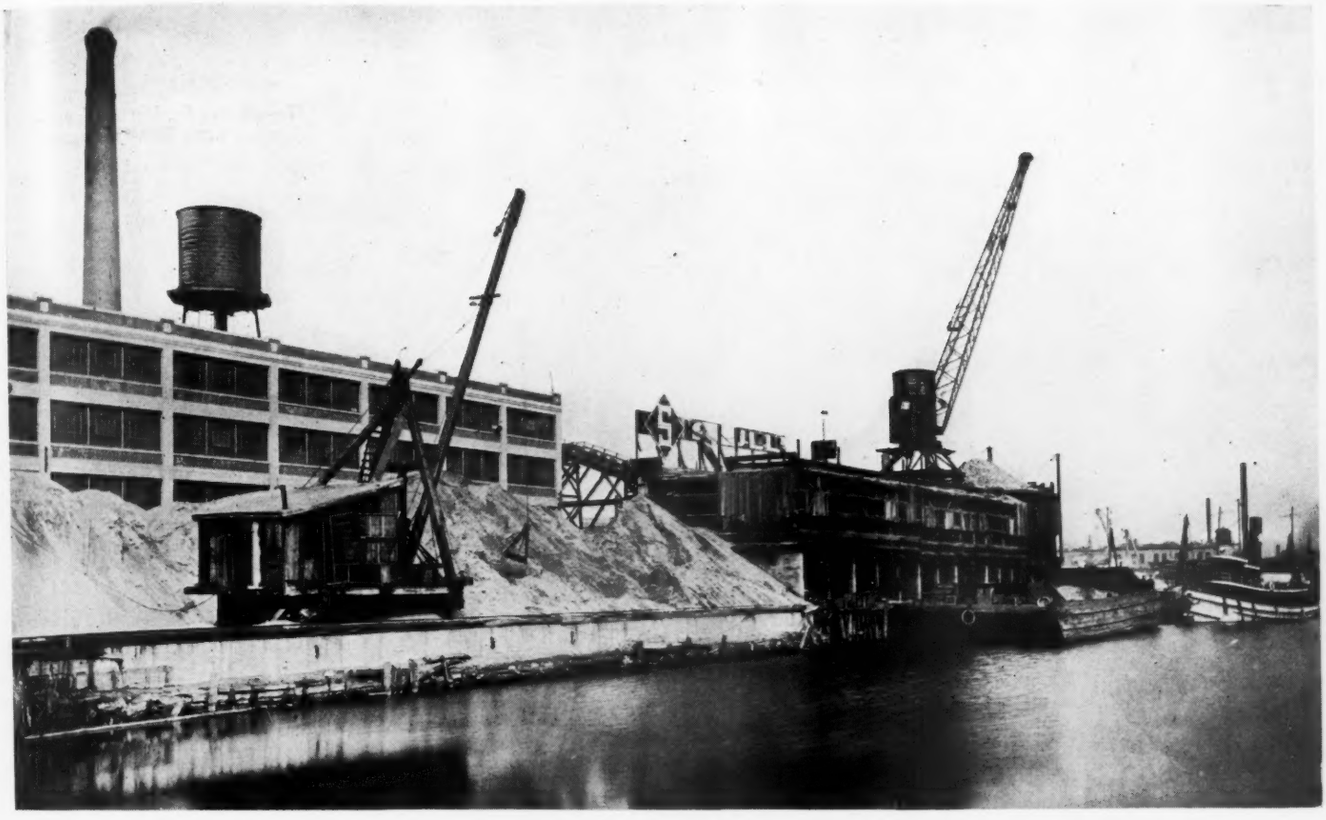
The dredging is carried on in a comparatively shallow part of Boston bay near Hingham, Mass., which was an important port in Colonial times. The loaded barges are brought to the dock in Cambridge by a tug boat of the company's fleet. The tow is 14 miles and it is made in all weathers. Three barges are brought in by each boat.

These barges hold 750 tons each and they are very substantially built, as they have to be to stand towing through the storms of a New England winter. One of these barges was being fitted with a new cargo box when a Rock Products editor visited the Cambridge yards, and some idea of the solidity of the construction required was obtained. Instead of being built of 2x12 planks on edge, as is the custom in building the cargo boxes on river barges, this cargo box was built of 4x8 timbers cribbed up and solidly bolted together. The deck was tarred and then covered with tar paper to prevent leakage of water from the wet sand or gravel into the hold, and a false deck was laid over the tar paper. This protects the main deck from the wear of the clamshell used in unloading the barges.

The sand barges are all divided into either two or four compartments by partitions. This enables the barges to be kept trimmed at all times while loading and also allows

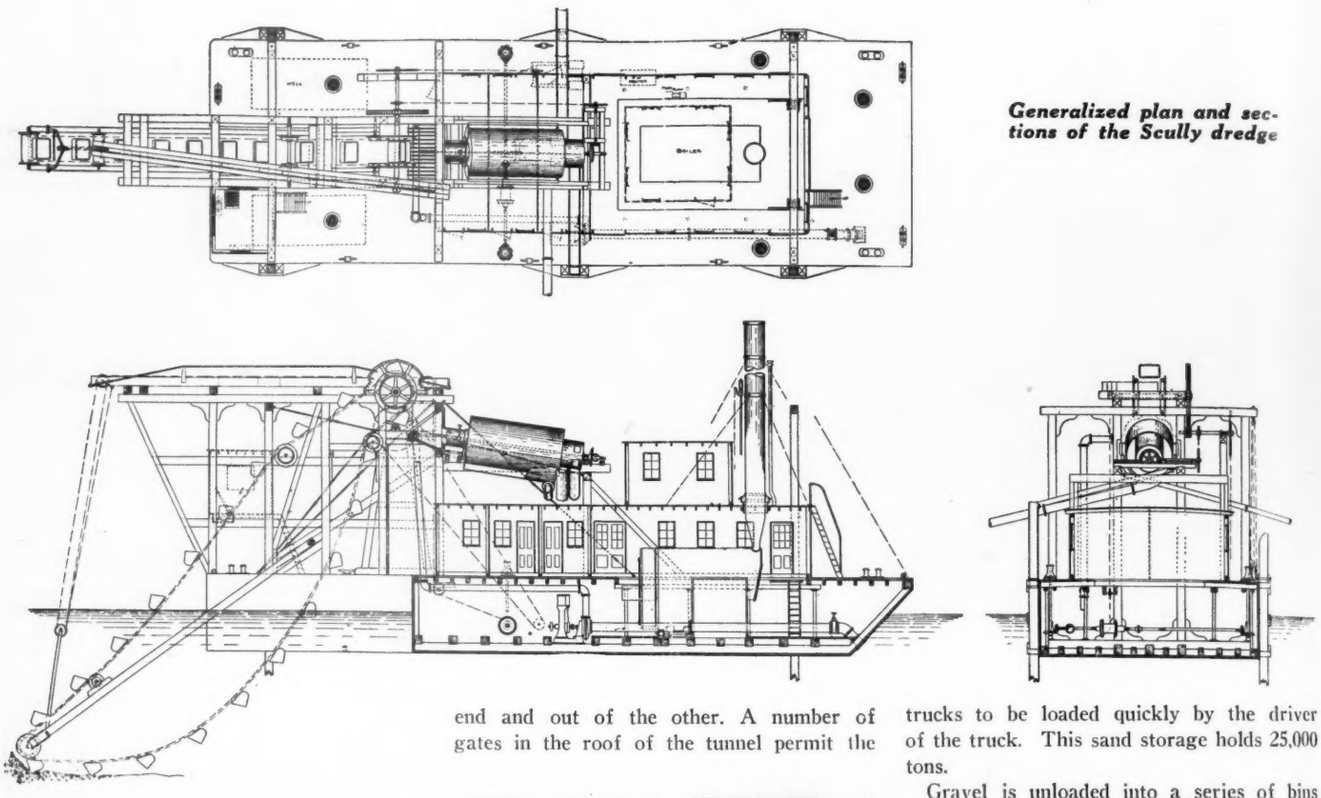


Two views of the Scully Co.'s plant at Arlington, one of the rapidly building suburbs of Boston



Dock and sand and gravel plant of the Scully Co. on the Charles river in Cambridge

The ladder dredge at Hingham, Mass., with two of the compartment barges which this company uses

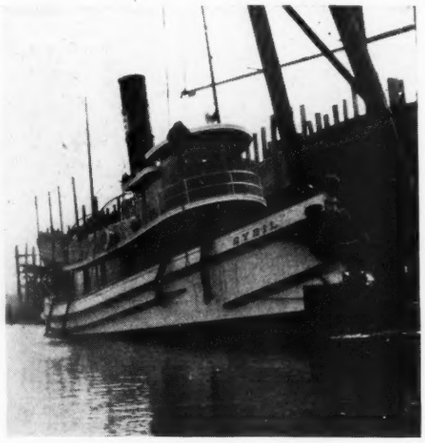


Generalized plan and sections of the Scully dredge

putting fine and coarse sand on the same barge.

On reaching the dock in Cambridge the barges are unloaded by either a Brownhoist crane or a derrick with wooden boom on an A-frame mounting. The A-frame derrick is used only for sand, the Brownhoist for both gravel and sand. Owing to its situation on top of the bins, its long boom and its mobility, this crane can reach almost any part of the storage system. Mead-Morrison 1½-yd. clamshell buckets are used with both machines.

The storage system as a whole is one of the best that the writer has seen anywhere. Concrete sand is stored in an open pile over a concrete tunnel. This is wide and high enough so that trucks can drive in at one end and out of the other. A number of gates in the roof of the tunnel permit the trucks to be loaded quickly by the driver of the truck. This sand storage holds 25,000 tons.



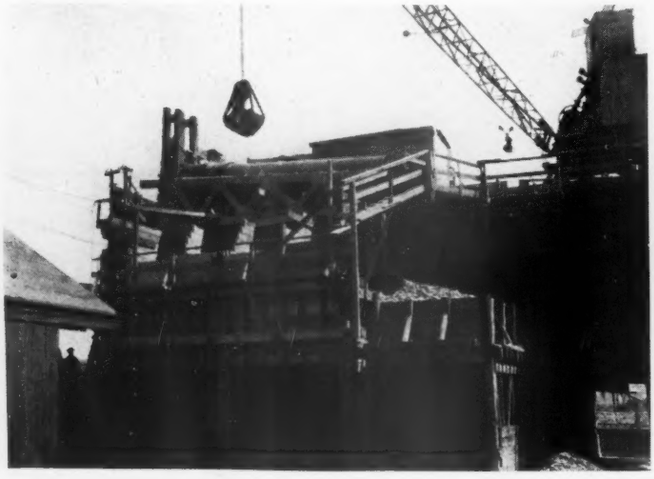
Tug boat of the Scully fleet

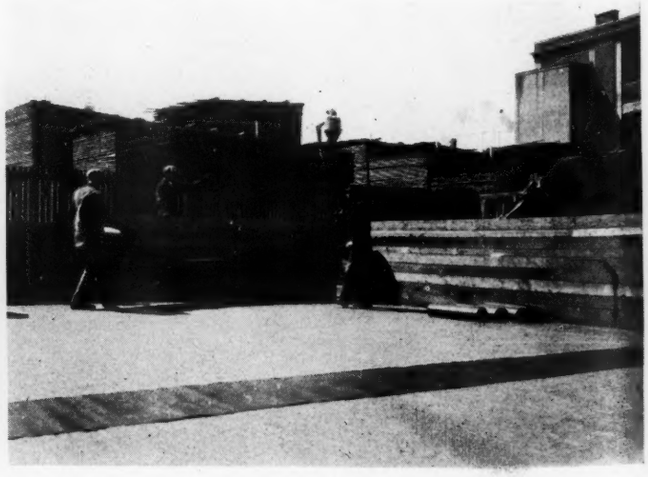
Gravel is unloaded into a series of bins which holds 22,000 tons. These are very substantially built of timber and are high enough from the ground so that trucks may back in and load from gates in the bin floor.

Stockpiling of Fine Sand

Fine sand is carried in a stockpile that is filled from a conveyor belt. A belt and elevator lifts the sand from this to a hopper, from which it is loaded into trucks through a gate. This elevating and conveying system was designed and built by the Link-Belt Co. and the main belt is 24 in. wide and 150-ft. centers. The hoppers were designed and built by the Scully Co.

Having the storage arranged in this way it is possible to load a number of trucks at once, and this is of great advantage when





Left—Oversize is brought to the yard for crushing. The crusher is below the small bins shown. Right—Putting a new cargo box on a barge. The workmen are laying tar paper on which a false deck will be laid

Left—Conveyor from bins to fine sand storage. Right—The fine sand stockpile built below the conveyor

deliveries are called for in a hurry, as they are in the peak of the building season. On one occasion 500 tons was loaded for delivery in 25 minutes. Seventeen trucks can be loaded at the same time, and as the driver has only to back in and open a gate, the loading is very rapid.

All Deliveries by Truck

All sales from this yard are for truck delivery and all sales are by weight. The loaded truck drives from the bin to a truck scales at the office and the driver receives his ticket and passes on. Few plants have a better system for taking care of retail deliveries quickly and in order.

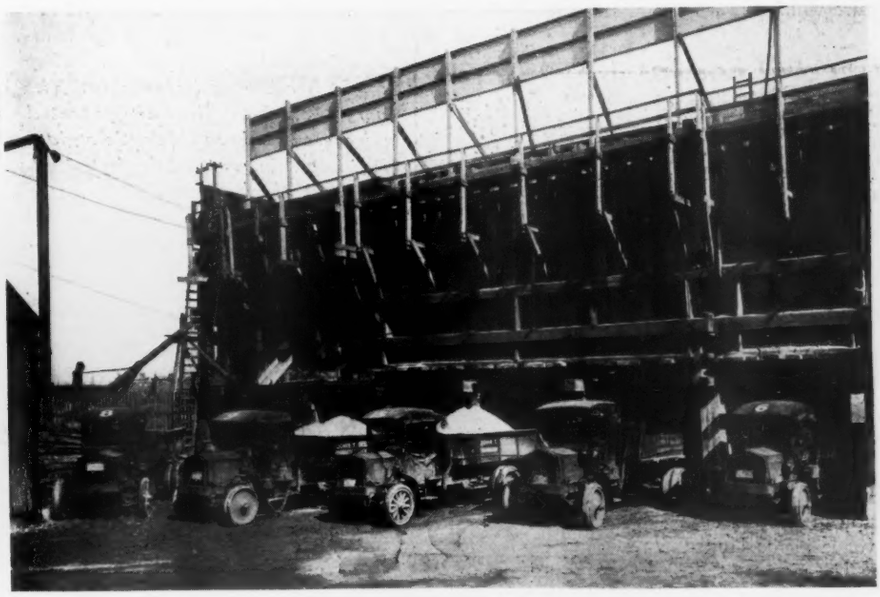
The company operates a fleet of 23 trucks, using the Mack, White and Sterling makes.

The office of the company is at 118 First street, Cambridge. James J. Scully is president. Frank Scully is treasurer and is an engineer and a graduate of the Massachusetts Institute of Technology. The yard is superintended by E. A. Mahoney, who has been with the Scully Co. 24 years.

The company has another operation at Arlington which is near Cambridge. This is a bank operation which employs a 2½-yd. Sauerman scraper bucket and a Meade-Morrison double drum hoist especially built for dragline operation. The material dug by the bucket is discharged into a hopper below ground and taken by an elevator to a revolving screen above the plant bins.

One of the Scully trucks

E. A. Mahoney, who has been yard superintendent for 24 years



Loading for retail deliveries. The loading system permits 17 trucks to be loaded at the same time and as much as 500 tons in 25 minutes has been loaded

Lenawee Company to Double Output

PRODUCTION at the plant of the Lenawee Sand and Gravel Co., Tecumseh, Mich., will be doubled in 1926, according to plans of company officials. Last year the plant turned out 1511 carloads of gravel and before the close of the present season it is expected to produce more than 3000 carloads, thus almost doubling its output in its first two years.

The pit first started to produce in April, 1924. In order to develop the deposit to the stage where dredging equipment would be practical, the first excavations were made by slack-line cableway. This has brought the development to a sufficient depth for the use of dredging equipment, which has been ordered and will be employed as soon as it arrives.—*Adrian (Mich.) Telegraph.*

Sulphuric Acid and By-Products from Gypsum and Anhydrite*

Processes Developed in Germany During the War May Furnish New Markets for Gypsum Rock

By John H. Perry

THE most common uses of gypsum are of small value as compared to its potential worth as a possible source of sulphuric acid and cement. Any process, therefore, that may be developed to attain these ends will be most welcome to exploiters of rock products, cement manufacturers and consumers of sulphuric acid. It has been estimated that three-fourths of all the gypsum mined is sold for wall plaster, which is a comparatively cheap product. A process, therefore, that would allow the manufacture of sulphuric acid and cement would give a more efficient utilization of gypsum.

There have recently been a number of events which have combined to awaken a new interest in possible processes for a more economic utilization of gypsum than is now the lot of this mineral. The cost of crude sulphur, which is now the principal source of sulphur for the sulphuric acid industry of the United States, has recently increased rather considerably. It would seem that sulphur prices would undergo even more drastic increases in the future: immediately, because of the heavy inroads placed upon the reserve stocks of this material; and a continual rise in price, on account of the obsolete methods of manufacture which cause very high production costs.

Forced by the War to Obtain Sulphur from Gypsum

It has been known for some time that during the late war, Germany resorted to the use of gypsum as a raw material for the manufacture of sulphuric acid. The details of the process or processes have not been known, however, until recently. The processes developed and exploited during the period 1914-17, have been continued since the war, and are the source of a considerable amount of the sulphuric acid manufactured in Germany at the present time. In addition to obtaining sulphuric acid from gypsum, there is also obtained, as a by-product, large quantities of cement. There is, therefore, every incentive to ascertain the most promising methods for a more effective utilization of gypsum than is at present in vogue in the United States.

The Farbenfabriken vorm. Friedr. Bayer and Co., of Leverkusen, Germany, are perhaps the most successful exploiters of this method for the utilization of gypsum. Before a description of their plant and process is given, it will be interesting and valuable to summarize, briefly, the most important of the patents and processes that have been worked out for the manufacture of sulphuric acid and valuable by-products from gypsum.

The possibility of obtaining sulphuric acid from gypsum has been known for a long time. As early as 1746, Marggraf found that when gypsum or anhydrite is heated with charcoal an acrid gas resembling that of burning sulphur is given off. In 1765, Lavoisier proved that gypsum is a compound of sulphuric acid and lime. Since 1850, there have been a number of processes proposed, but until comparatively recently there has been no successful commercial application of any of these processes either in Germany or elswhere.

The following is a chronological list of the principal patents and processes that have been proposed for the utilization of gypsum in the manufacture of sulphuric acid and by-products:

1847. Tilghmann (English patent, February 1), passed steam over red-hot gypsum, and obtains lime, together with sulphur dioxide, oxygen and some sulphur trioxide.

1854. Shanks (English patent, October 9), patented von Seckendorff's process. (See below.)

1854. Margueritte (English patent, December 22), treats lead phosphate with hydrochloric acid to obtain lead chloride and phosphoric acid. This acid when heated with gypsum gives calcium phosphate and sulphur trioxide. The lead phosphate originally used is regenerated by boiling lead chloride with the calcium phosphate. The hydrochloric acid is, however, lost in the process, and must be renewed for the next cycle of operations.

1855. von Seckendorff (Wagner's Jahresberichte, p. 54), decomposes gypsum with lead chloride at the low temperature of 75 deg. C., to form calcium chloride and lead sulphate. This latter salt is then mixed with hydrochloric acid at 75 deg. C., which converts the lead sulphate into the original lead chloride (which is used over again), and sulphuric acid.

1856. Kohsel (Wagner's Jahresberichte, p. 57), reduces gypsum with coal to form calcium sulphide. This compound is then decomposed by carbonic acid to give hydrogen sulphide, which is oxidized to sulphur dioxide and then converted into sulphuric acid.

1858. Kuenzi (Wagner's Jahresberichte, p. 95), fluxes gypsum with quartz, sand, clay, etc., which forms an easily fusible slag and at the same time liberates oxygen and sulphur dioxide.

1858. Bandiner (Wagner's Jahresberichte, p. 102); Fleck; Reinsch (Wagner's Jahresberichte, p. 1670 [1870]); and others. obtain ammonium sulphate by treating gypsum with a solution of ammonium carbonate. This process is said to have been in commercial use in France for a number of years.

1862. Nickles (Wagner's Jahresberichte, p. 229), roasts a mixture of calcined gypsum, rock salt and pyrolusite (manganese dioxide).

1863. O. Siemens (Wagner's Jahresberichte, p. 208), fuses a mixture of gypsum and ordinary salt. This fused material is then decomposed

DURING the war Germany, cut off from sulphur importations, developed methods of making sulphuric acid and cement from gypsum and anhydrite by improving on processes that had long been known. After the war gypsum was found to furnish a cheaper sulphur than could be imported and the business was continued. There are possibilities that similar methods of using gypsum rock may be developed so that they can be used in the United States and elsewhere. If they could furnish a market for anhydrite, which has little commercial value at present, they might become of importance. The very complete list of patented processes given in this article gives it unusual interest to the investigator and they show that a large amount of research on the subject has already been accomplished.—The Editors.

*Adapted and enlarged from translations of the following articles by W. J. Müller: Zeit. Angew. Chemie, p. 169 (1926). Umschau, page 28, (1926).

with steam. This process has rereceived rather severe adverse criticism by Buff (Wagner's Jahresberichte [1864], p. 170).

1865. Archereau (Wagner's Jahresberichte, p. 271), and later Fremy suggested the process of Kuenzi (see above) but with the added advantage of utilizing the oxygen evolved.

1874. Martin (Bull. Soc. Chim., p. 47), and (French patent 96276), obtains an artificial sulphide by roasting a mixture of gypsum, ferric oxide and coal in a blast furnace. Since the product must be further treated to produce sulphur dioxide, this process would cost more than the best grade of pyrites.

1876. Schott (Dingl. polyt. J., *221*, p. 142), roasts a mixture of sodium sulphate, gypsum and coal. In addition to obtaining sulphur dioxide, the roasted material is used in the manufacture of glass.

1884. Scheuerer-Kestner (Comptes rendus, 99, p. 876), ignites a mixture of gypsum and ferric oxide (preferably with fluorspar), to obtain sulphur trioxide.

1886. Lake (English patent, 7355), and Cummings (U. S. patent 342,785), kiln roast a mixture of gypsum and clay, whereby sulphur dioxide, sulphur trioxide and oxygen are liberated. The residue is converted into a hydraulic cement.

1887. Polony (Austrian patent; see also Zeitschrift fur Angewandte Chemie, 1888, p. 57), patented a process identical with that of Tilghman (see above).

1900. Claus, Baranoff and Hildt (German patent, 104,188), roast a mixture of gypsum and coal to obtain calcium sulphide and carbon monoxide and dioxide. These gases, in the presence of water, react to give calcium carbonate and hydrogen sulphide. This latter gas then reacts with anhydrous gypsum at red heat to form calcium sulphide and sulphur dioxide.

1900. van Denbergh (U. S. patent, 642,390), electrolyses fused gypsum with an excess of oxygen to obtain sulphur trioxide.

1901. Palaschowskii (Russian patents 5464 and 5477), describes certain modifications of the process of Baranoff and Hildt (see above). Instead of simply mixing gypsum with coke, he molds them into briquettes with coal-tar. This method is said to considerably shorten the time of reduction.

1901. Badische Aniline u. Soda-Fabrik (German patent application B. 79,367), transform gypsum into magnesium sulphate, which is then heated either alone or with carbon to obtain oxides of sulphur.

1902-3. Basset (French patents 324,570 and 331,897), briquets a mixture of gypsum, carbon and tar. These briquettes are then roasted to obtain sulphur dioxide.

1909. Hilbert (German patent 207,761), obtains sulphur trioxide, as well as a glass, by igniting a mixture of gypsum, sand and alkaline sulphates.

1909. Trey (Zeitschrift fur Angewandte Chemie, p. 2375), produces sulphuric acid from gypsum on a laboratory scale, by heating gypsum with pure silica or sand.

1910. Wedekind and Co. (German patent, 232,784; English patent, 20,186; French patent, 419,871, and U. S. patent, 1,008,847), roast a mixture of gypsum, sand and pyrites to obtain sulphur dioxide.

1911. Anzies (Mining World, *35*, p. 112), heats almost dehydrated gypsum with suitable amounts of ferric oxide, to obtain sulphur dioxide.

1913. Natho (German patent 265,835), heats a mixture of gypsum, sand and water in an autoclave for several hours at 600-800 deg. to obtain sulphur trioxide as well as some sulphur dioxide and oxygen.

1914. Cantilena (Italian patent, 413,166), mixes powdered, roasted gypsum with dried clay in such amounts that the ratio of silica plus alumina plus ferric oxide to the lime is about 0.45. This mixture is briquetted and heated to about 1600 deg. C. The residue is a sort of portland cement.

1914. Bamback (English patent 3174; German patent application P. 30,692, and French patent 470,652), subjects a red-hot mass of gypsum to the action of a burning mixture of gas and air.

1915-17. Dirks (German patents 295,906 and 301,791), first prepares ammonium sulphate by treating gypsum with ammonium carbonate solution, then decomposing this sulphate with phosphoric acid. The ammonium phosphate thus otained is decomposed by simple heating into ammonia and phosphoric acid, which are re-used in a repetition of the cycle.

1916. Williams (Trans. Amer. Ceramic Soc., *18*, p. 271), describes some laboratory experiments to determine the minimum practicable dissociation temperature of gypsum in contact with clay. He concludes: (1) Clay and a mixture of water glass and ferric iron in the presence of carbon monoxide reduced the dissociation temperature materially. (2) Below 700 deg. C. the rate of dissociation was very slow, both for mixtures of gypsum and clay, and those of gypsum, water glass and ferric oxide. (3) The dissociation temperature is materially lowered in the presence of carbon monoxide, since 1200 deg. C. is the dissociation temperature of gypsum, under atmospheric conditions.

1917. Basset (English patent 124,842), proposes the process of manufacturing ammonium sulphate by treating gypsum with ammonia and carbon monoxide.

1918. Basset (U. S. patent 1,244,280), manufactures a hydraulic cement together with sulphur dioxide by adding an excess of carbon to a mixture of clay and gypsum and heating in a kiln. The excess of carbon used is proportional to the amount of oxygen supplied to the furnace and effects a reduction of a part of the gypsum to calcium sulphide. The reduction products are subsequently reoxidized by atmospheric air.

1919. Hampel (Chemiker Zeitung, *43*, pages 617-19 and 634-6), describes the process of treating gypsum with ammonia, carbon dioxide and water.

1919. The Badische Aniline and Soda-Fabrik (German patents 298,491; 301,682, 302,433, 302,471, 305,123 and 306,313), prepare sulphur from gypsum. This was one of the German war-time processes, and is said to be still in use, because it yields a sulphur of 99.95% purity, and at a cost smaller than that of the imported material.

1920. Chemischen Fabriken vorm. Weiler-Ter-Meer (German patent 307,772), calcines a mixture of gypsum and coke at 1000 deg. C. to obtain sulphur dioxide.

1920. Kaselitz (Zeitschrift fur angewandte Chemie, p. 49), describes a process of reducing gypsum with coke in a rotary furnace at 1100 deg. C. to form calcium sulphide. This sulphide is then decomposed with steam and the resulting hydrogen sulphide is oxidized to sulphur dioxide.

1920. Riesenfeld and Feld (J. Chem. Soc. London, 1921, p. 40), reduce either gypsum or anhydrite at 700 deg. C., and above, with carbon. Under suitable conditions, pure calcium sulphide is obtained.
Riesenfeld and Hesse (see above reference), reduce gypsum with methane at 800-1000 deg. C. to obtain calcium sulphide. The sulphide is then treated with excess steam at 1200 deg. C.

1924. Mannheimer (Zeitscrift fur den Physik and Chem., Unterricht., *37*, p. 47), has prepared ammonium sulphate on a laboratory scale by adding powdered gypsum to a 20% ammonium carbonate solution, containing 20% of free ammonia. Carbon dioxide and ammonia are then introduced into this mass. A source of cheap ammonia would be required to make a further study of this process at all attractive. This process has been patented by the Societe Industrielle des Produits Chimiques, principal French patent 427,665 (1910), and followed by additions in 1910, 1911 and 1912. It is also protected by the German patent 253,553.
Cari-Mantrand, treats roasted gypsum with dry hydrogen chloride to give sulphur dioxide, oxygen and some sulphur trioxide.
The Elektrizitatswerk Lonza (Swiss patent 72,627), obtain sulphuric acid by treating gypsum and quartz in an oxygen-enriched air.

For one reason or another, local conditions or the complexity of the process, etc., few of the above processes have had much, if any, commercial exploitation.

One Plant Still in Operation

One plant, however, that was built during the war is still in successful operation in Germany. W. J. Muller, in two recent articles (Zeitschrift fur Angewandte Chemie, p. 169 [1926], and Umschau, p. 28 [1926]) has described this plant somewhat. The excerpts below have been adapted from a translation of these articles.

This process, owned and operated by the Farbenfabriken vorm. Friedr. Bayer and Co., of Leverkusen, Germany, is a modification of some of those cited above.

Crushed and dried coke and clay slate are mixed and ground with gypsum in a ball mill. This mixture then passes through a

rotary tube furnace. Coal dust (previously ground in a tube mill) is fired at the lower end of the furnace. A cement clinker is obtained at the lower end of the furnace, and a gas containing a sulphur dioxide is evolved at the upper end. This gas, after treatment for the removal of dust, is then converted into sulphuric acid. The cement clinker is cooled and gypsum and dry, ground slag are then added. This mixture is then passed through a mixing mill, where the ingredients are thoroughly incorporated to give cement.

In order to obtain a gas of sufficiently high concentration of sulphur dioxide (6-7%), the mixture of coke, clay and gypsum must be dried before its introduction into the furnace. Another necessary precaution to be observed in order to obtain a good cement is that the gases must be slightly oxidizing, since a reducing atmosphere causes the formation of calcium sulphide in the clinker, which is known to have a deleterious effect.

The rotary furnace used is said to be 164 ft. in length and 10 ft. in diameter. It is cooled by means of water drips at the end next the burner, in which the coal dust firing is carried out.

This plant is stated to have a monthly output of 3000 tons of cement clinker and 2800 tons of sulphur trioxide. Cost data for this plant are not available. It has been stated, however, that although coke is used in the present instance, a low-grade fuel that is unsuitable for any ordinary purpose may be substituted for the coke.

Not Practical at the Present Price of Sulphur

With the present cost of sulphur, it is readily conceded that any proposed process for the utilization of gypsum merely as a raw material for the manufacture of sulphuric acid will be unprofitable. If the price of sulphur should be further advanced there would seem to be a good possibility of the commercial success of a process that could furnish a good cement as well as sulphuric acid from gypsum. Even with the present price of crude sulphur, the systematic investigation of this problem would be justifiable for the purpose of obtaining production costs under American conditions. Although the apparent success of this process in Germany is not, of course, an *a priori* reason for a similar success under American conditions; nevertheless it is a sufficient reason for those interested in gypsum and cement to initiate studies along similar lines.

The Non-metallic Minerals Experiment Station of the Bureau of Mines at Rutgers University, New Brunswick, N. J., has undertaken a study of the chemical and physical properties of gypsum, having in view its more general utilization. A preliminary report (U. S. Bureau of Mines, Reports of Investigations, Serial No. 2654, November, 1924) has already been published. The future work on gypsum at this experiment station will be awaited with great interest.

Increased Production of Fuller's Earth in 1925

THE production of fuller's earth in the United States in 1925 was 206,574 short tons, valued at $2,923,965, it is announced by the Bureau of Mines, Department of Commerce, which is preparing a report on the subject, in co-operation with the Geological Surveys of Alabama, Florida, Georgia, Illinois and Texas. This is an increase of 16% in quantity and 11% in value compared with 1924. These increases were due in part to the reappearance of California and Nevada as producers of fuller's earth, though every state that reported production in both 1924 and 1925 showed an increase. The output was reported by 14 operators in seven states in 1925, namely California, Florida, Georgia, Illinois, Massachusetts, Nevada and Texas; in 1924, production was reported by 13 operators. California and Nevada reported no production in 1924, and Alabama, which was a producer in 1924, reported none in 1925. Georgia was the leading state in production in 1925, with Florida second and Texas third, as in 1924. These three states produced 85% of the total output. The average value per ton of fuller's earth was $14.15 in 1925 compared with $14.79 in 1924.

Fuller's earth is a term used to include a variety of natural substances that possess the property of absorbing grease or clarifying, bleaching, or filtering oil. They are mostly clay-like substances, though recently discovered material in the West, which is of different character, is said to be superior to the Eastern fuller's earth. The original use of fuller's earth was in the fulling of cloth, but little of it is now used for this purpose. It is used almost exclusively in the bleaching or filtering of vegetable and mineral oils.

Until 1895, when fuller's earth was successfully produced commercially in Florida, the United States was entirely dependent on foreign supplies. The imports have on the whole been decreasing in recent years. In 1925, however, they were 8015 short tons, valued at $111,295, an increase of 10% in quantity and 20% in value. Notwithstanding this increase the quantity of fuller's earth imported in 1925 was the smallest, except in 1924, since 1897.

The exports of fuller's earth are not separately shown by the Bureau of Foreign and Domestic Commerce, but five producers reported that in 1925 they exported 6195 short tons of fuller's earth, which was a slight decrease from 1924.

Power Show Includes New Features

PRELIMNARY plans for the fifth National Exposition of Power and Mechanical Engineering indicate that the coming event, which is to be held in the Grand Central Palace, New York City, from December 6 to 11, 1926, will be even larger and more inclusive than the fourth exposition.

Three entire floors of the Palace have been sold to exhibitors and a portion of the fourth floor. Contracts have been signed with 332 manufacturers of all types of mechanical and power plant equipment.

An important innovation in the conduct of the coming exposition will be the addition of several exhibits essentially educational in character which point out the tremendous advances that are being made in mechanical design and construction.

Mining fullers earth at the Florodin plant near, Quincy, Fla.

The drying, crushing and screening plant of the Florodin Co.

Extensive Improvements in Lime Plants of the Woodville, Ohio, District

Survey of This Important Center Reveals Determination to Increase Production Efficiency

By E. S. Hanson
Associate Editor, Rock Products

THE reputation of the "finishing hydrate" produced in the Woodville district of Ohio is such that all the territory east of the Rocky Mountains is considered their fair market by these manufacturers, and sales are made regularly to Pacific coast points.

The building material business is highly competitive, and price is the deciding factor in a majority of cases; but there are many stories told in Woodville of sales of Ohio hydrate which have been made at a premium, just so that a careful owner might have the comfortable assurance that all would be well with the plastering of his building.

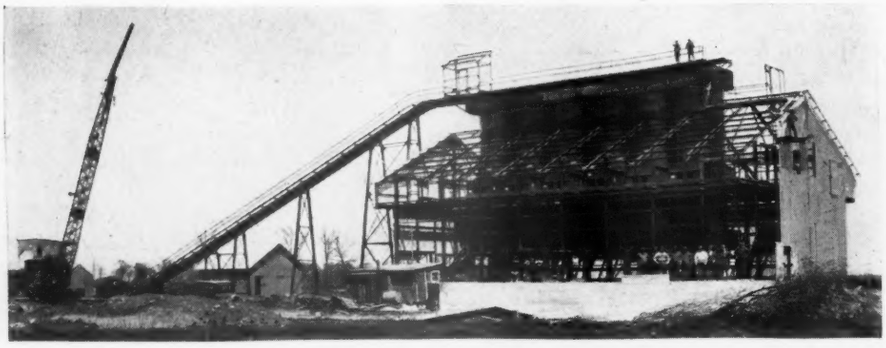
The country is absorbing well up toward 700,000 tons annually, which one careful figurer estimates to be the capacity of the plants in the Woodville territory to turn out this product. So with an established reputation to maintain, and this wide market to hold, it is but natural that these producers are paying close attention to their manufacturing methods, from both the quality and efficiency standpoints. During my recent visit the fact that most impressed me was that the district is up on its toes, studying lime production with almost the fervor of a discoverer of a new art.

The thing one hears most about just now in Woodville is the necessity for a longer cooling section in the kiln. From the standpoint of conservation of heat in the kiln and the ease of drawing off the burned lime, because of lower temperature, this is one point of manufacturing practice on which all the producers are fully agreed and plant design is being revised accordingly, with the firing floors made correspondingly higher. Then, of course, there is also the recognition of the fact that firing methods are not as efficient as they should be, with their resulting variations in temperature which are likely to result in damage to the product, and a high fuel ratio. This is a part of the general problem on which there is not as much unanimity of thought; but it is being given careful study in connection with which the technical articles on this and related subjects published from time to time in Rock Products have been given close reading and have won general appreciation.

Ohio Hydrate Has New Crushing and Burning Units

The most extensive improvements being made at present in the Woodville district are those of the Ohio Hydrate & Supply Co., this improvement covering not only the lime plant proper but the quarry operations and the crushing and screening practice as well. The stone plant is practically completed and is in operation on a partial schedule and furnishing kiln stone to the old lime plant, as well as a considerable amount of commercial stone. It is about at the end of its tuning up process and with a few minor adjustments and the addition of one or two items to give it proper synchronization, it will be in full swing. The new lime burning plant has the kilns installed and the auxiliary equipment is rapidly being put in place.

Experimental lime plant with one-third size kiln, being built at Woodville



Bruns plant under construction. The crane is used in building and will later deliver coal to firing floor

New equipment in the quarry includes a No. 92 Marion electric shovel, two 16-ton Plymouth gasoline locomotives, and a full complement of 9-yd. Easton side-dump cars. These cars, loaded in trains of four, enter the crusher house at quarry floor level. This means that the crusher itself must be some distance below grade. In this position its 255 tons of weight are carried by a firm stratum of rock about 30 ft. below that at present being worked, and it is surrounded by concrete walls, waterproofed with hydrated lime, giving it complete protection from ground seepage or the entrance of surface water.

Jaw Crusher with 500 Tons Per Hour Capacity

This initial unit, designed to give the plant any quantity of stone up to 500 tons per hour, is a Traylor jaw crusher with 60x84-in. opening, a length of jaw from top to bottom of 18 ft. and carrying 16-ft. driving pulley and 12-ft. fly-wheel. It is belt-driven from a 350-h.p. electric motor located on an intermediate floor in line with the drive shaft of the crusher.

The crusher is fed by a Traylor apron feeder 6 ft. wide and 11 ft. long, the travel of which is controlled by a hand lever on the main floor of the building where the operator can have full view of the feed. The cars as they come from the quarry are dumped onto this feeder by means of a Curtis air hoist.

Overhead in this building and covering every part of it is a 50-ton electric traveling crane, which is now kept in operating condition in order to take care of repairs to the crusher should such be necessary, and later will come into frequent use when the machine shop is installed in one end of this large crusher house.

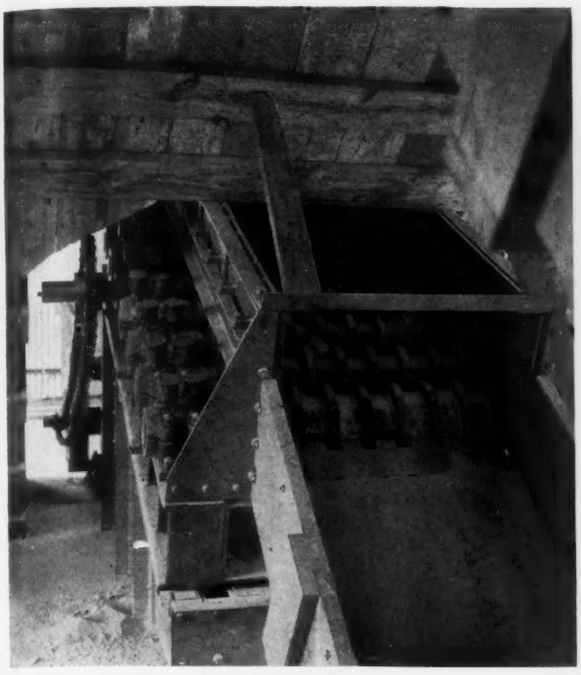
The crusher delivers its stone to a 48-in. Link-Belt pan conveyor, which carries the material to another building, where a preliminary separation is made. This pan conveyor is 137 ft. on centers and is driven by a 100-h.p. motor connected to the head pulley of the conveyor by means of a Link-Belt silent chain drive.

By preliminary separation is meant that at this point is taken out the large stone for the lime plant, relieving the conveyor system at once of any further handling of this tonnage. This separation is made by passing the stone from the pan conveyor over a Robins "Cataract" grizzly of five 16-in. rolls. This allows all material up to 4½ in. to fall through, the larger stone passing over the grizzly and falling into the bins from which the kiln stone is drawn.

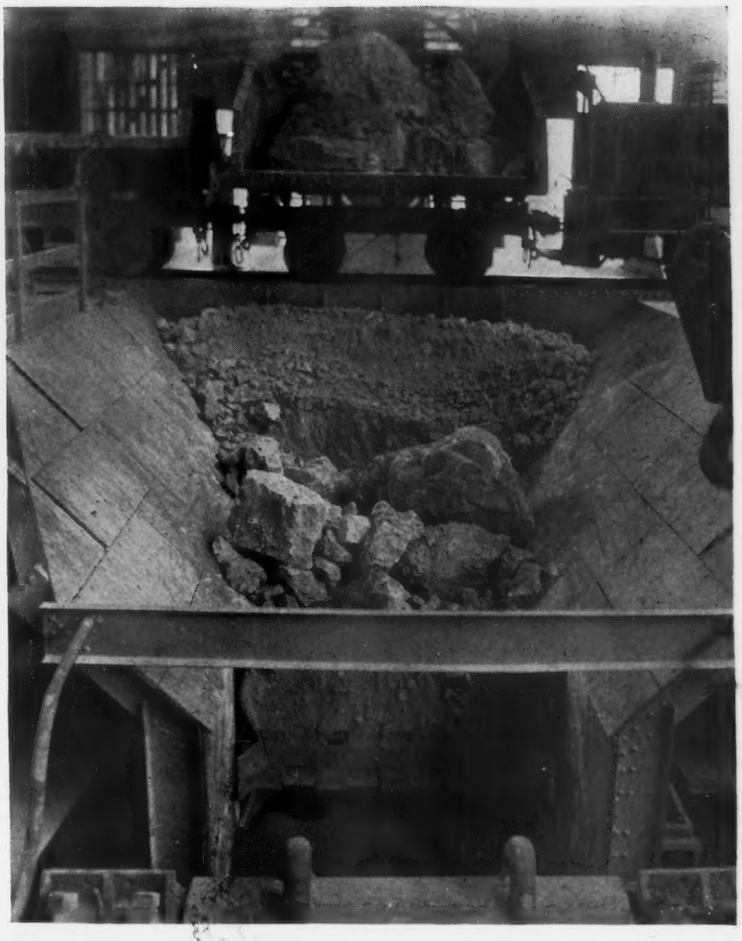
The stone which passes through the grizzly is normally fed on to the main belt conveyor and goes direct to the commercial screening plant. Under certain contingencies, such as an unusual demand for fluxing stone, a further separation at this point is found to be an economy, and provision is made for bypassing the material to a second Robins "Cataract" grizzly which takes out the stone above 3½ in.

The material designed for the commercial plant is fed onto a 30-in. Robins belt conveyor on 371-ft. centers, and is carried to the

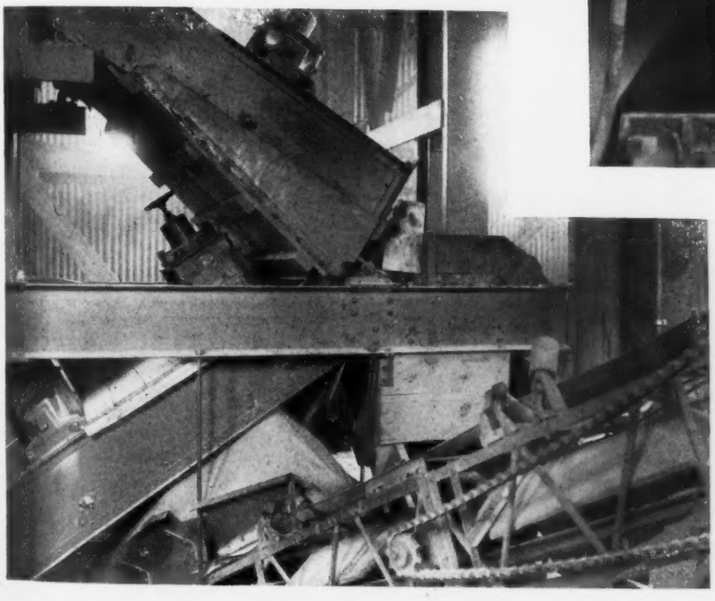
Ohio Hydrate and Supply Co.—In foreground is crusher house and machine shop, and at the left the bins for kiln stone with grizzlies above. At discharge end of belt conveyor is commercial screening and storage, with recrushing house below. New lime burning house at back center



One of the grizzlies



Where the cars dump into big crusher



Some of the vibrating screens

Main belt conveyor

Some new features of plant of the Ohio Hydrate and Supply Co., Woodville, Ohio

New kiln house and hydrating plant of Woodville Lime Products Co.

top of the screening house, which stands near the edge of the quarry at ground level. The feed onto the belt at this and other points is by means of Robins shaking feeders. The belt conveyor, as are other conveyors at the plant, is entirely enclosed in a structure of steel and corrugated galvanized iron, large and well lighted and with an easy walkway its entire length. At a midway point is a junction house where the material from the recrushing mill comes up on an auxiliary belt and is returned to the main conveyor.

Three Methods of Screening

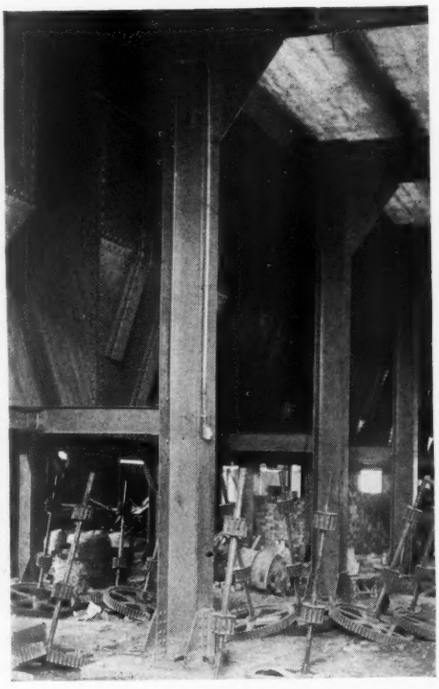
At the top of the screening house the material falls from the belt conveyor on another Robins rotary grizzly with five 8-in. rolls, and from this to a Robins "Roco" shaking screen. Then follow four Hum-mer vibrating screens in series, one of them a double-surface machine making two separations. Ten sizes of commercial stone are made in all, and are sold for a variety of uses, including the chemical trades, concrete products, agricultural purposes, highway and general concrete work, steel fluxing, etc.

The bins are all of steel construction, and the commercial bins have a capacity of 30 cars. Four loading tracks have access to them, and in addition there is a truck road leading to the bins without interference from the railroad tracks.

A recrushing building is provided for taking care of peak demands, or for taking from the bins any sizes which are not moving and recrushing them to sizes immediately marketable. This building is equipped with a No. 7½ Austin crusher, and a 36-in. Symons disc is being added. The product of the crushers is carried by a 20-in. belt conveyor to the junction house before mentioned, and there transferred to the main conveyor.

New Lime Plant Has 12 Kilns

The new lime-burning plant, which is now under construction, occupies a building 64x 176 ft. in plan, and houses 12 kilns. These



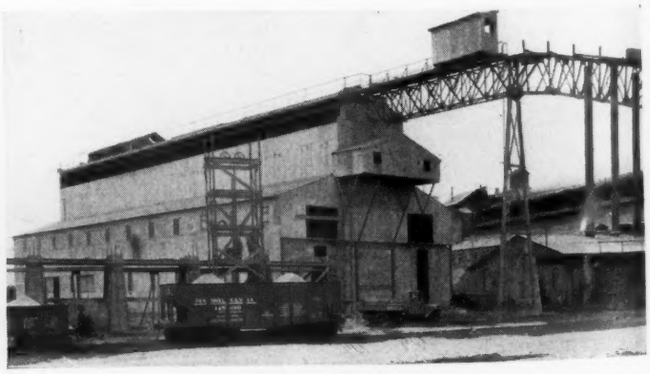
have 12½ ft. steel shells and extend 31 ft. above the firing floor. Below the firing floor extends a straight kiln section 4 ft. in length before the cone bottom is attached. Harbison-Walker fire brick is used for lining.

The kilns will be equipped with McGinty shaking grates, under which steam will be supplied for moisture and induced draft. Draw shears will be hand operated through rack and pinion. The lime will be drawn into cars and taken to cooling bins by small gasoline tractors, after being weighed on Fairbanks recording scales.

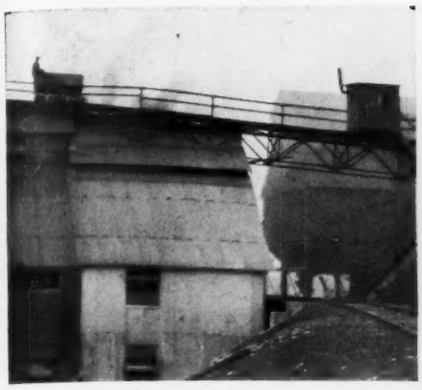
The track which carries the stone to the top of the plant spans the center of the kilns, requiring the use of bottom-dump cars. The cars are drawn up the incline by means of a Lidgerwood single-drum electric hoist, and after dumping are returned to the incline by counterweight. The cars draw their loads direct from the bins in the quarry below the initial grizzly, two tunnels being provided for their loading.

Coal will be used for firing, as in the present plant of the company. An elevated track is being provided for its delivery to the new plant, under which will be installed a pan conveyor, taking the coal to a United Iron Works crusher and thence by bucket elevator and two drag conveyors to either side of the kilns, spouting it directly to the firing floor.

The lime and crushing plants have both grown out of the experience of men in the organization. Three who have co-operated most closely on their design have been E. G.

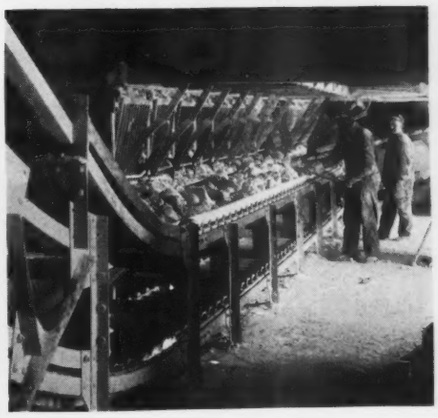


Stone and lime plants of Ohio Hydrate and Supply Co., with detail of kiln installation above



How kilns were added to Kelley Island plant at Gibsonburg

Fred Witmer, new president of Ohio Hydrate and Supply Co.



Picking table where lime is sorted

Baker, late president, whose death occurred on April 3; Fred Witmer, secretary and sales manager of the company since its inception and now promoted to the presidency since the death of Mr. Baker; and J. R. Reaver, the superintendent.

The crushing plant was erected by the Massilon Bridge and Structural Co. and the kiln buildings by the Bellefontaine Bridge and Steel Co. All the new buildings are of steel frame on concrete foundations, covered with Armco and Toncan corrugated metal. The machinery has been installed by the company.

Mr. Witmer, in addition to his recent election to the presidency of his company, has also been chosen to head the Finishing Lime Manufacturers' Association of Ohio. The remaining personnel of the Ohio Hydrate & Supply Co. includes: E. H. Mauntler, secretary-treasurer; Otis Bittinger, general manager; Frank E. Coombs, traffic manager; Russell L. Hardy, chemist.

Building an Experimental Lime Plant

One project now under way which is notable from the standpoint of technical progress in lime manufacture is the building of an experimental lime plant by Arnold & Weigel, engineers and builders, who have had such a large part in the development of this district. This plant is conveniently located just at the village limits of Woodville, and almost within a stone's throw of some of the other plants of the locality.

It is expected at this plant to overcome the handicap under which the experimenter in lime burning has usually worked—that of having to carry on his studies in connection with the performance of a full-size commercial kiln. This is an expensive method of investigation, both in the actual cost of the work itself as well as in lowered production of marketable lime during the time a kiln is devoted to such purpose.

It seemed, however, that this and other drawbacks in the existing situation must be overcome if the work necessary to bring lime manufacture to the most efficient basis was to be done; and this experimental plant appeared to be the solution to the problem.

The main feature of the plant is a kiln of the Arnold type, made in one-third size. It is believed that all data derived from the lime burning in such a kiln can be adapted to the control of kilns of full size in actual commercial practice, while having the advantages of ease and low cost of operation. It will be found particularly advantageous in experimenting with different kinds of kiln linings, as the lining in such a kiln can be changed with comparative ease. The kiln will be equipped with automatic stokers, and provision is made to produce steam by absorbing some of the heat in the fire boxes which would otherwise be radiated, and supplying as desired the necessary moisture for the kiln.

The building which has been erected for this experimental plant is 36x48 feet in plan and 20 ft. high. Its equipment will include a Weber hydrator, Raymond mill, Sturtevant rotary grinder, Bates valve bagger, small Ingersoll-Rand air compressor, and the necessary elevating and conveying equipment to make a complete plant in miniature. A chemical laboratory is also included.

It is the hope that through the work done at this experimental plant, methods of production may be so perfected as to increase output, cut down the fuel ratio, and otherwise be of service to the lime industry. The results of experiments will be given out freely, for the benefit of all producers.

Special experimental and testing work will also be done for individual producers and for manufacturers of machinery and equipment.

Entire New Plant for Woodville Lime Products

The Woodville Lime Products Co. has an entire new burning and hydrating plant, completed and soon to be put in production.

This new unit comprises 12 kilns, making 53 in all now controlled by this company, and by reason of their larger size adding 30% to the capacity. The kilns are of the Arnold type, using coal for burning, and are equipped with pneumatic draw shears. Clyde hydrators are installed. This company is now in process of reconstructing its office building in Toledo, which suffered considerable damage from fire a short time ago.

Steel kilns replacing concrete kilns at plant of National Mortar and Supply Co., Gibsonburg, Ohio

Bruns Company Installing Six Kilns

The Bruns Hydrated Lime Co. has its kiln house and power plant at Woodville nearly completed, and the foundation is being put in for the hydrating plant.

The burning equipment includes six Arnold kilns enclosed in a steel building covered with Armo corrugated iron. These will be hand fired with coal, the fuel being delivered to the firing floor by a traveling crane through hatches in the roof.

The present equipment of the boiler house includes a Stanwood boiler of 150-hp. capacity, Cook deep-well pump and 12x10-in. Ingersoll-Rand air compressor.

Notes of Other Activities In the Woodville District

The National Mortar and Supply Co. completed in March at its Gibsonburg plant the replacement of 15 concrete kilns with the same number of steel kilns. The concrete structures were removed to the level of the quarry floor and 10-ft. steel shells erected in the same location. These are fired by producer gas manufactured at the plant under the Duff patents.

The Kelley Island Lime and Transport Co. has added two modern steel kilns to each of its two batteries of brick kilns at Gibsonburg. The inclines to the quarry allowed sufficient room to add these without alteration.

At White Rock the same company has torn down an 11-kiln plant and substituted 11 new kiln shells with Arnold linings. The firing floor has been raised 30 in. A new Clyde hydrator, with Raymond mills in connection, has also been put in.

The Zorn family of Gibsonburg, well known in the lime industry, is having plans made for a new 12-kiln plant at that place.

Bureau of Standards Studies the Effect of Certain Materials in the Finish Coat of Plaster

IN 1922 there were erected at the Bureau of Standards 98 experimental panels of plaster in the finish coat of which were incorporated various materials of several sizes, as being likely to cause trouble if present.

Now, after four years, the panels have been examined with the following results:

Core (ground limestone) and mica have no effect regardless of size.

Magnesium sulphate and sodium chloride cause efflorescence.

Iron carbonate, iron sulphide (pyrite), and lime burned during hydration tend to cause unsoundness but not seriously if fine.

Overburned lime will always give trouble regardless of size.

Tannic acid is deleterious because it discolors the plaster and gives rise to "checking."

In view of this work the following is recommended as a basis for a specification for the soundness of hydrated lime:

Examine microscopically to insure the absence of calcium oxide (index of refraction equals 1.81).

Wash the sample through a No. 50 sieve. Dry and weigh the residue and figure it as per cent of the sample. If the residue is more than 5%, it should be analyzed. If this is found to contain less than 90% calcium carbonate, the shipment represented by the sample should be rejected.

Pyrite can hardly occur in hydrated lime, but may be a constituent of the sand. A specification for sand is required, which should also carry limits on the quantity of salt and organic matter permissible.

Cement Plant for North Dakota Believed Possible

POSSIBILITY that a cement plant may some day be operated in North Dakota is advanced by Capt. I. P. Baker, Bismarck, as the result of information contained in a letter recently received by Senator Lynn J. Frazier from the director of the U. S. Geological Survey of the Department of the Interior.

According to this letter, Captain Baker pointed out, the Niobrara limestone which is found in North Dakota can be used in making cement. It recently has been utilized for cement manufacture near Yankton, S. D., and gives promise of being a future source of cement material in Iowa and Nebraska.

The problem in so far as North Dakota is concerned, the letter states, "will be to find a high calcium limestone sufficiently thick and suitably located with reference to transportation facilities and fuel supplies. The clay or shale ingredient in portland cement could doubtless be supplied from many of the shale formations within the state. The wide distribution of glacial drift over a large portion of the state has effectually concealed the beds that might be most useful for cement making, namely the Niobrara limestone formation."

A bulletin on useful minerals occurring in the United States points out that natural cement is found in Cavalier county along the Tongue river about 10 miles north of Milton, Pembina county.

Captain Baker believes that if a bill, now before Congress, which has as its aim the geological examination of various states, is passed, North Dakota will be shown to have valuable natural resources which can be used in making cement.—*Jamestown (N. D.) Sun.*

Cement Company to Grind Oyster Shells

WORK is being completed on a new branch of the Pacific Portland Cement Co., Consolidated, at their plant at Redwood City, Calif., in which agricultural lime will be made from the shells dredged from the floor of the bay, according to a Redwood City, Calif., local paper. The new building, which will house this branch of the industry, is now in course of construction and will, when completed, cost in the neighborhood of $150,000. In this part of the plant the shells instead of being converted into cement will be calcined and ground for lime and for the use of poultry farms.

The construction of a second unit for the plant is now under consideration and will, it is thought, be started within the near future.

Union Rock Company Building New Storage Bunkers

WORK has been started on the new rock storage bunkers and office building at Wilmington, Calif., for the Union Rock Co., Los Angeles, Calif. Both structures are expected to be ready for use within a few months.

The bunkers will be of concrete and frame construction 100 ft. high and 42x106 ft. in ground dimensions, and will cost $35,000 to build. The office building is a one-room, one-story frame building, 16x20 ft. The company will use the bunkers as its central supply point for construction throughout Los Angeles and neighboring counties. The new structures will be adjacent to the Southern Pacific and Pacific Electric tracks, and a spur track will be built to serve the plant.—*Wilmington (Calif.) Journal.*

Laboratory of Ohio Hydrate and Supply Co. and Russell L. Hardy, plant chemist, at work

Lime-Silica Index as Measure of Cement Quality*

Proposal to Grade Portland Cements in Terms of Both Strength and the Relative Content of Cementing Constituents —Specification for Tensile Strength and Quality Proposed

By Thaddeus Merriman
Chief Engineer, New York Board of Water Supply, New York City

IT is generally agreed by the best authorities[1, 2] that the principal components of portland cement are tricalcium aluminate ($3CaO \cdot Al_2O_3$), tricalcium silicate ($3CaO \cdot SiO_2$) and beta dicalcium silicate ($2CaO \cdot SiO_2$). The minor components are believed to be magnesium oxide (MgO) and tricalcium ferrite ($3CaO.Fe_2O_3$).[3] In addition, the cement also contains added gypsum ($CaSO_4 \cdot 2H_2O$), together with small quantities of the alkalis, raw silica, water and carbon dioxide (CO_2).

Of these components, only the tricalcium and dicalcium silicates are believed to be possessed of cementing qualities. The others, except possibly tricalcium aluminate, are therefore to be considered as inert matter. Tricalcium silicate, of itself, displays all of the properties of average portland cement.[2] Its hydrations proceed in an orderly manner and the addition of a retarder to control its reactions is unnecessary. It is the component without which cement would not be portland. Dicalcium silicate, on the other hand, hydrates slowly and develops little, if any, strength until after the lapse of several weeks.[2]

The preceding outline is a condensed statement of the best knowledge regarding the composition and cementing qualities of the components of portland cement. It does not, however, contain an answer to that important question which is being asked on every hand—namely, how is it possible to distinguish between cements on the basis of their content of cementing value?

Coal is sold on its thermal units, asphalt by the bitumen it carries, fertilizer on its percentage of nitrogen, while cement still sells by the barrel. In the world of finance the banker computes his percentages to thousandths, but in the construction world intrinsic cement value receives scant consideration.

By applying the method used for the recasting of chemical analysis of minerals, Colony[3] has shown that the percentages of tricalcium and dicalcium silicate present in a completely burned cement may be computed.

*From *Engineering News-Record*, April 22, 1926.

THE method by which Mr. Merriman obtains his lime-silica index for judging cement is briefly this: He assumes that whatever remains as insoluble residue in an analysis of the cement is uncombined silica and he therefore first subtracts this from the total silica to find how much silica is combined with lime. Then he calculates how much of the lime present would be needed to combine with the alumina, iron and sulphur trioxide present and subtracts this from the total lime. The lime remaining after this subtraction is divided by the silica left after subtracting the insoluble residue and the quotient is the lime-silica index.

It is obvious that the higher the lime-silica index the higher the compounds will be in lime, that is the greater the proportion of the lime combined as tricalcium silicate. A low index would show more of it to be combined as dicalcium silicate (as much of it must always be in practice) which is less desirable as a cementing material. Hence a high lime-silica index should indicate a high cementing value. But the presence of free lime would also give a high lime-silica index. This would be shown by the strength test, which would be lower than the index would indicate. As there are other factors than the amount of lime and silica in combination that affect the strength of cement (the fineness to which it is ground for example) the 7-day tensile strength test is as important as the lime-silica index, and hence Mr. Merriman's proposed cement specification includes both.

By combining an adaptation of this procedure with the showing of cementing content as indicated by the tensile strength a method has been developed by which cements may be classified with respect to their content of absolute quality.

What the Lime Silica Index Is and How It Is Found

The lime-silica index shown in the tabulation for each cement is the percentage of lime in the cement which is available for combination with the available silica divided by the percentage of the available silica. As already pointed out, only the tri- and dicalcium silicates are possessed of cementing value. Hence, in determining the value of a cement, only the lime and silica available for combination with each other should be considered. All other combinations and substances are practically inert and must be excluded if a clear understanding of the possibilities is to be had.

The available silica is the total silica less the insoluble residue, while the available lime is the total lime less the lime which is in combination with the alumina, the ferric oxide and the sulphuric anhydride. The percentage of lime in combination as tricalcium aluminate is the percentage of alumina multiplied by 1.64. The percentage of lime in combination as tricalcium ferrite is the percentage of ferric oxide multiplied by 1.05, and the percentage of lime combined as calcium sulphate is the percentage of sulphuric anhydride multiplied by 0.70.

By Way of Example

By way of example, in cement *A* the available silica is $23.27 - 0.10 = 23.17\%$. The available lime is $61.65 - (6.08 \times 1.64 + 2.34 \times 1.05 + 1.57 \times 0.70) = 48.12\%$. The lime silica index, then, is $48.12 \div 23.17 = 2.08$.

A cement in which all of the lime is combined with the silica in the form of the desirable tricalcium silicate would show a value for the index of 2.80 which is the ratio between the weights of three molecules of lime and one molecule of silica. Since tricalcium silicate is the highest known form of the lime-silica compounds, an index value of 2.80 cannot be exceeded unless free lime be present. Many practical considerations, however, operate to hold the index far be-

low 2.80, which represents the extreme of theoretical perfection.

A cement in which all of the lime is combined with the silica as dicalcium silicate would show an index of 1.87 (the ratio between the weights of two molecules of lime and one of silica). This value then represents the lower limit for the lime-silica index in cements which have been calcined only to the point of producing dicalcium silicate.

The foregoing considerations render possible the following deductions:

1. The quantity of the cementing components contained in any particular cement depends on the thoroughness with which its lime-silica combinations have been perfected.

2. A cement of low lime-silica index can never be made so as to contain as much of cementing value as another cement of higher index value which has been manufactured with equal care and thoroughness.

3. The higher the lime-silica index of a cement and the lower its seven-day strength, the less thoroughly have its combinations been completed.

If the eight cements in the accompanying tabulation had all been ground to the same degree of fineness at the raw end and had been calcined so as to insure equal degrees of combination, then their cementing values, as indicated by their strengths, should have been in proportion to their respective lime-silica indices. The values for the tensile strengths at seven days, however, show wide variations which, it seems, can be attributed only to differences in the completeness of the formation of the lime-silica compounds which they contained. (The matter of fineness will be referred to later on.)

The seven-day tensile strength has been adopted in this discussion because much data are available at that age. It is believed, however, that the strength at three days would be an even better criterion because it would be more truly indicative of the tri-calcium silicate content of the cement. As already pointed out, this is the most valuable of all the compartments and is believed to be the one which produces "the amorphous constituent" that is always present in the greatest proportion in the best and most durable concretes.[4]

Examples from Tests

In the accompanying figure are plotted the relations between the lime-silica index and the seven-day tensile strength of portland cement standard mortar briquets of 298 cements tested in the Board of Water Supply laboratory during the years 1921-1925. These cements came from 21 different plants in the United States and from four plants in Europe.

On the diagram has been drawn a line *AB* which represents the approximate upper limit of the relationship between tensile strength and the lime-silica index. The more nearly the plotted position of a cement approximates this line, the more nearly does that cement approach what may be said to be the best of that particular composition which is attainable under present methods of manufacture.

A cement the lime-silica index of which is 2.35, and which shows a strength of only 250 lb. at seven days, has not been as completely and as thoroughly made as a cement of the same strength which has a lime-silica index of 2.05. The first of these cements carries a far larger proportion of undeveloped and inert lime-silica compounds than does the latter.

On the basis of the data presented and in view of the generally accepted premises as to the constitution of cement, there seems to be no escape from the conclusions which have been indicated. Any other interpretation would contravene the best of all the knowledge that is now available.

The deductions above presented may be emphasized in the following theorems:

(a) That cement which shows the highest strength at seven days for a given lime-silica index has been most thoroughly made and calcined.

(b) That cement which shows the lowest strength at seven days for a given lime-silica index has been least thoroughly made and calcined.

(c) As between two cements of equal lime-silica indices, that which shows the higher strength at seven days will contain the least inert and underburned material.

(d) As between two cements of equal strength at seven days, that which has the lower lime-silica index will contain the least inert and underburned material.

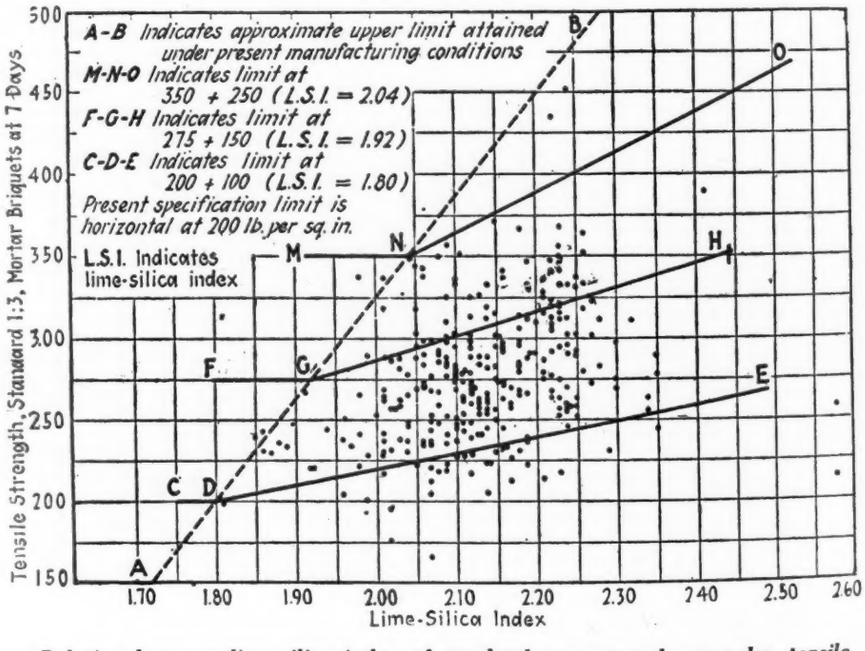
As an important corollary it is therefore indicated that strength alone is not a criterion of either cement value or cement quality. The well-known belief of many users that certain cements "are better than others" thus finds confirmation in such manner as to admit of definite expression.

Fineness and Strength

The relationship between fineness and strength has been investigated by Bates.[5]

LIME-SILICA INDEX AND TENSILE STRENGTH OF CEMENTS OF VARYING COMPOSITION

		A	B	C	H	D	E	F	G
Silica	SiO_2	23.27	22.56	21.17	21.68	21.19	20.85	20.69	24.68
Lime	CaO	61.65	62.73	62.83	61.92	61.60	63.04	65.32	66.82
Alumina	Al_2O_3	6.08	7.52	8.55	5.78	7.13	6.76	7.68	2.11
Iron oxide	Fe_2O_3	2.34	2.27	2.81	3.14	1.77	2.87	1.85	0.92
Magnesium oxdie	MgO	3.14	2.02	1.44	2.14	3.98	3.36	0.99	1.73
Sulphuric anhydride	SO_3	1.57	1.72	1.75	2.64	1.78	1.68	1.85	0.74
Loss on ignition		1.80	1.15	1.17	2.40	2.46	1.27	1.44	2.90
Total		99.85	99.97	99.72	99.70	99.91	99.83	99.82	99.90
Insoluble residue		0.10	0.45	0.32	0.40	0.28	0.55	0.27	0.62
Fineness per cent passing No. 200 sieve		78.9	82.4	77.8	95.8	93.7	85.8	86.1	94.6
Lime-silica index		2.08	2.11	2.14	2.22	2.23	2.35	2.42	2.57
Tensile strength standard 1:3 mortar at 7 days		220	165	263	449	452	290	390	258



Relation between lime-silica index of portland cement and seven-day tensile strength of standard mortar briquets

On the ten cements studied by him the effect of grinding from an average fineness of 78.3 to 90.5 was to increase the average tensile strength of 1:3 mortar briquets at seven days from 269 to 300 lb. per sq. in. In detail, the finer grinding caused three of the cements to lose strength, while three others showed gains of from 6 to 22 lb. The remaining four gained from 55 to 113 lb. per sq. in. The evidence as to the effect of fine grinding on the seven-day mortar test cannot, therefore, be said to be convincing. Fine grinding evidently can confer nothing in the way of additional cementing value, although it may render more available that of which the cement is possessed. The grinding of the inert material of a cement so as to cause more of it to pass through a standard sieve is essentially equivalent to the addition of finely divided clay. On the other hand, the more finely the active material of a cement is ground, the more quickly will its cementing qualities become manifest. In other words, fine grinding cannot compensate for either a deficiency of cement value or for an underburning of the product. For the purpose of this discussion, therefore, the effect of fineness on the relationship between the lime-silica index and the tensile strength at seven days seems to be a factor of minor importance, within the limits of fineness to which cement is now being generally ground.

Practical Applications

The considerations advanced find practical application in the formulations of requirements for the determination of cement quality in terms of tensile strength and the lime-silica index. The present specification calls for a minimum strength of 200 lb. per sq. in. at seven days. A line drawn horizontally across the diagram at this value shows that practically all of the cements tested exceeded this requirement. The present agitation for a strength of 225 lb. at seven days proposes to draw a new horizontal line at approximately 10 per cent above the old requirement. Such new limit would rule out only a comparatively small number of the cements included on the diagram and would continue to sanction the low burned, high limed cements which contain only a sufficient proportion of cementing material to enable them to meet the minimum strength requirements. Cements of this character contain correspondingly more inert substance of no cementing value and, inferentially at least, seem to be the more likely to produce non-permanent concrete in exposed situations. These cements, moreover, and particularly if finely ground, require greater attention to moisture conditions during the curing period if their full value is to be realized.

Proposed Specification

A rational specification for both tensile strength and quality can be written by taking due account of the lime-silica index. The user who is in the market to get the most cement value for his money should, in order to be certain of quality, specify the strength he requires in terms of this index. By way of example, if it be desired to secure those cements which contain the smallest proportion of the inert lime-silica compounds, the user will require a tensile strength in pounds per square inch at seven days of:

$350 + 250 \times$ (lime-silica index $- 2.04$),

it being also provided that the strength shall never be less than 350 lb. This requirement will include all cements lying above the line *MNO*.

If, however, the buyer is satisfied with such cement as lies above the general average of that now in the market, he will specify a seven-day strength of:

$275 + 150 \times$ (lime-silica index $- 1.92$),

with the proviso that the strength shall always exceed 275 lb. This requirement would include all cements above the line *FGH*.

As a specification which would be only a small step in advance of present standard requirements the consumer would prescribe a tensile strength of:

$200 + 100 \times$ (lime-silica index $- 1.80$),

providing further that the strength shall never be less than 200 pounds.

It is believed that the considerations which have been set forth will be of interest to those who seek the best of cement value for use in situations where the requirements are such as to demand a product of better than either standard or average quality.

Other Constituents

While this discussion has been confined to the important relationship between the lime-silica index and the tensile strength at seven days, it is to be noted that the quality of a cement is also dependent on its content of alumina, of magnesia, of ferric oxide and of calcium sulphate. That is to say, as between two cements of equal seven-day strength and equal lime-silica index, the one which contains the least of the materials enumerated will be the better. The alkalis also have their effect.

All of the information on which this discussion has been based was assembled and co-ordinated by L. Bernard Stebbins, assistant to the chief engineer. The chemical analyses reported were made by Richard H. Gaines, chemist.

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[1] The Ternary System $CaO \cdot Al_2O_3 \cdot SiO_2$. Rankin and Wright. *Am. Journ. Science* 39, Jan., 1915.

[2] Properties of the Calcium Silicates and Calcium Aluminates Occurring in Normal Portland Cement. Bates and Klein. Technologic Paper No. 78, U. S. Bureau of Standards.

[3] Judging the Quality of Portland Cement. Colony. *Transactions* Am. Inst. Mining & Metallurgical Engineers, 1921.

[4] Petrographic Study of Portland Cement. Colony. The School of Mines *Quarterly*, 36, Nov., 1914.

[5] Effect of Fine Grinding and a Higher SO_3 Content Upon the Physical Properties of Portland Cement. Bates. *Proceedings* A.S.T.M., 15, 1915 and 23, 1923.

Increasing the Strength and Water Tightness of Cement Mortars

A RECENTLY filed patent claims that by adding small quantities of a mixture of protalbinic and lysalbinic acid to the mixing water of a cement mortar, the resulting mortar shows an increased strength and water permeability as compared with mortars made in the usual way. The organic acids employed are decomposition products of albumens made by heating albuminous substances with alkali solutions.

According to the patent claims, a mixing water containing 5% of these organic acids when utilized for making a cement mortar in the proportion of 1:3 produced a mortar that showed a 7-day tensile strength of about 11% higher than a similar mortar made in the usual manner and its 7-day compressive strength showed an increase of 28%. The mortar made under these conditions is also claimed to be absolutely water tight. The inventor also says that it is possible to add the dry organic acids to the finished cement if this is preferred.

California Highway Concrete Improved 40% in 1925

CONSTRUCTION department records conclusively show that the strength of portland cement concrete pavements laid by the California Highway Commission has been constantly improving, and, furthermore, that all types are becoming smoother and easier riding.

The average strength of the portland cement concrete pavements has in 1925 increased 40% over that obtained in 1924, and as much as 55% over the average of former years. Expressing it in another way and considering the value of the pavement on a compressive strength basis, the 6 in. slab cast during 1925 is the equivalent of 8½ in. of the 1924 concrete. The result is all the more remarkable when we consider that it was obtained without any increased cost to the state.

More attention than ever before is being paid to the scientific proportioning of mixtures going into all types of pavements.

The average strength of the individual cement concrete pavements constructed in 1925 ranged from 3427 to 5109 lb. per square inch. The general average for the year was 4311 lb. The average for the year 1924 was 3151 lb. Individual jobs varied from 2662 to 3950 lb. per square inch. Portland cement concrete shoulder widening ranged from 3370 to 4220 lb. per sq. in. during 1925, and from 3310 to 4220 lb. in 1924.

The difference in strength between full width pavement and shoulder concrete is due largely to the fact that in the latter a more plastic mix is required because the narrow width necessitates hand tamping and, furthermore, on shoulder work central mixing plants are generally used.—*California Highways.*

The Design of Stone Crushing Plants

Part I—Accessory Equipment to Go With Screens and Crushers

By Hugo W. Weimer
Consulting Engineer, Milwaukee, Wis.

IN previous articles the writer has endeavored to bring to the reader's attention the principal types of crushers and the screening equipment suitable for the average stone crushing plant. Many other details must be taken into consideration when designing a plant and this article will call attention to a few of them.

Crushers should have the proper opening to give the desired products and an estimate of the various sizes together with tonnage must be made in order to properly figure the screening equipment, which is a very important factor.

Reasonable clearance should be allowed over crushers to facilitate the handling of parts. Elevators are an important unit in any plant and some data regarding these are included in this article.

The Table of Sizes

In my article of January 23, 1926, I explained the relation of the ring size of product to the opening on the open side of a gyratory crusher bowl. To illustrate this more clearly and to give the screen perforation necessary to produce a given ring size of product table No. 1 has been prepared. It is a well known fact that the round perforation in a screen must be larger in diameter than the ring size of product desired. This is partly due to the curvature of the perforated screen but more especially because the material drops through the holes at an angle to the plane of the screen. As an example it will be noted that to produce 1½-in. ring size material a 1⅞-in. round hole will be required in the revolving screen and the largest opening in the crusher should be 1¼ in. Note that the diameter of the round screen perforation which is commonly called "screen size" is approximately 25% greater than the ring size of product that will pass it. It is commonly understood that the ring size of a piece of stone is determined by the smallest diameter of a round hole in a flat plate through which it can be passed by hand. Thus it happens that a rectangular piece which has a maximum dimension of 1½ in. one way and 2 in. the other way can be passed through a 1½-in. round hole and be classed as being 1½-in. ring size.

TABLE No. 1

Schedule of ring sizes of product with relative size of ground perforation in rotary screen and the gyratory crusher opening required.

Ring Size Product Inches	Screen Perforation Inches	Crusher Opening Inches
½	⅝	½
⅝	¾	⅝
¾	⅞	¾
1	1¼	1
1¼	1½	1⅛
1½	1⅞	1¼
1¾	2⅛	1½
2	2½	1⅝
2½	3	2
3	3¾	2¼
3½	4¼	2½
4	5	2¾
5	6	3½
6	7¼	4¼

Explanation of Product Diagram as Shown in Table No. 2

To obtain the maximum capacity from a crusher and to make the least amount of fines possible, it has been found advisable to make the setting or opening of such a size that about 15% of the product will be larger than the maximum ring size desired. This oversize is usually recrushed by returning it to the same machine for further crushing or to other crushers used primarily for fine crushing. It is quite necessary when designing a new plant or making changes in an existing installation to make a close estimate of the percentages of the various sizes of product produced by a crusher when set at a certain opening.

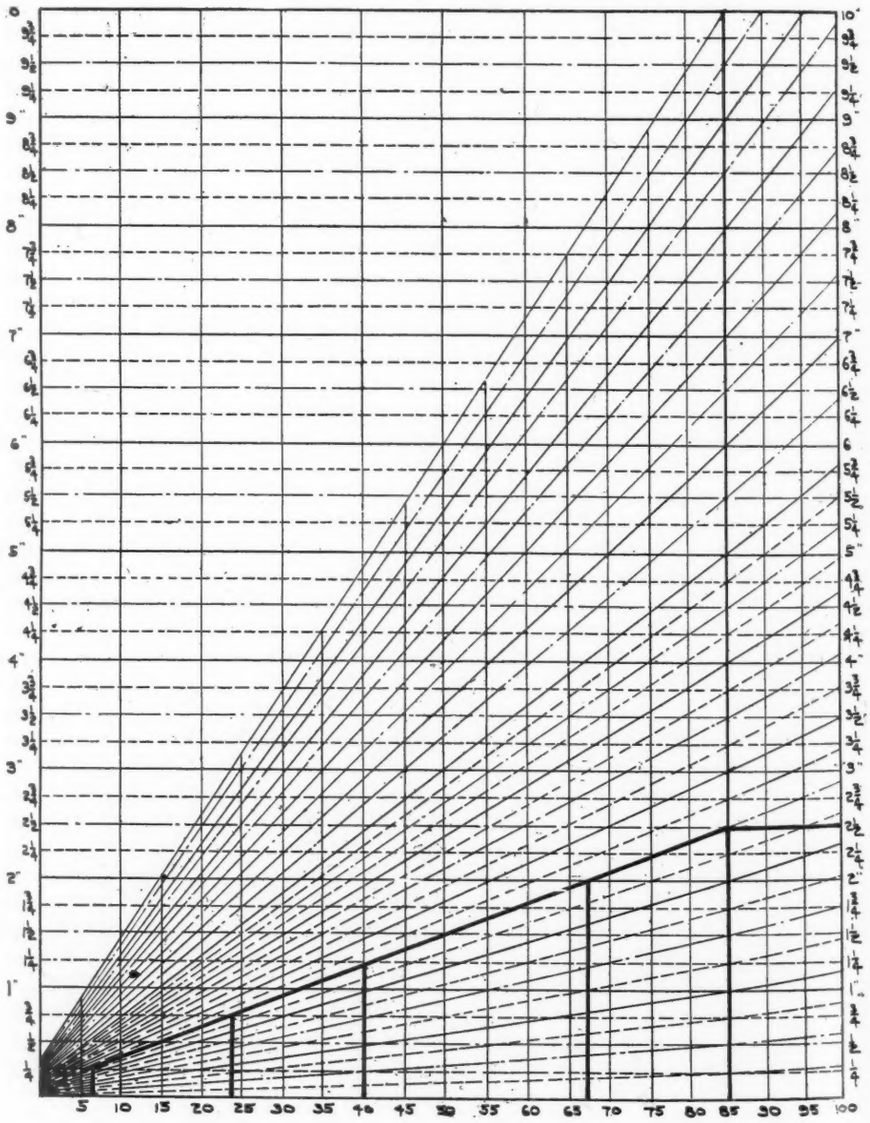


Diagram of Table No. 2—Figures on the side are ring size of product. Figures on the bottom are percentages

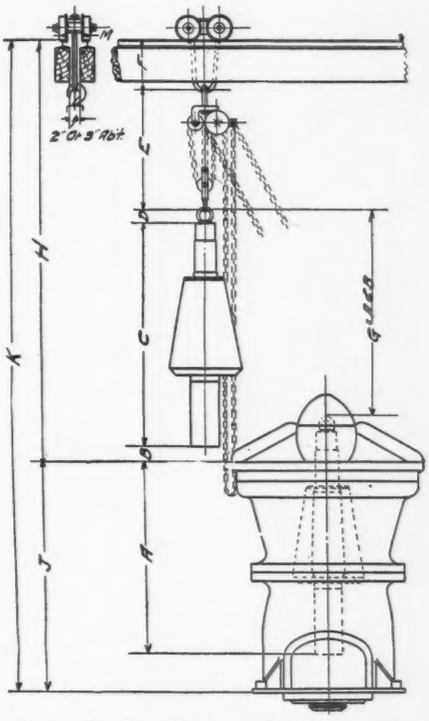
TABLE NO. 3

Capacity of chain hoist as listed is intended for lifting repair parts only, such as spider, or shaft with head, and not for top shell or main frame which may be required to be lifted during erection of crusher.

Size of crusher	Weight, lb. of shaft and head	Weight, lb. of spider	Cap. of chain hoist in tons	A Ft. in.	B In.	C Ft. in	D In.	E In.	F In.	G Ft. in.	H Ft. in.	J Ft. in.	K Ft. in.	M In.
8	2,600	3,000	2	4-5	6	5-8¼	4	21	14⅛	4-11	9- 5⅜	5-6¾	15-0⅛	7¾
10	3,500	4,300	3	5-0	8	6-0¾	4	23	14⅛	5- 8	10- 1⅞	6-2	16-3⅞	7¾
13	5,300	7,700	4	6-0	8	7-5	4	34	22	6- 8	13- 1	7-5⅝	20-6⅝	9
16	7,410	9,600	5	6-7	9	8-4	4	38	22	7- 4	14- 5	8-4	22-9	9
20	11,550	14,500	8	8-3¾	9	9-7⅝	6	43	23¼	9- 0¾	16- 4⅞	10-1	26-5⅞	11
36	22,900	26,000	16	10-1⅛	10	12-3½	7½	44	29	10-11⅝	19-10	12-2	32-0	11
40	36,300	40,000	20	11-6½	12	13-8¼	6½	50	29	12- 6½	21- 9¾	14-0	35-9¾	11
42	43,500	42,300	30	12-6	12	15-1	6½	63	36	13- 6	24-10½	15-5½	40-4	12
50	73,400	90,300	45	15-4⅝	15	17-6¼	12	90	36	16- 7⅝	30- 3¼	18-6½	48-9¾	12

The diagram shown in table No. 2 can be used to advantage in making this estimate. As an example we will assume that a crusher is set to produce a ring size product of 2½ in. and that 15% of the total amount will be over this size and that it is desired to know what tonnage will be less than ¼ in., plus ¼ in. and minus ¾ in., plus ¾ in. and minus 1¼ in., plus 1¼ in. and minus 2 in., plus 2 in. and minus 2½ in. and plus 2½ in. The horizontal lines represent the ring sizes and the vertical lines the percentages. To clearly illustrate this problem heavy lines are used on the diagram for this purpose only. Finding the 2½ in. ring size as shown on the right hand side and following the horizontal line to the 85% vertical line, we find the diagonal line to use for our example. Following the diagonal upward we find that the maximum ring size of product will be about 2⅞ in. in size. Thus if the total feed to the crusher is 50 tons per hour, 15% of this or 7½ tons will be over 2½ in. ring size and less than 2⅞ in.

Following the diagonal downward to the intersection of the 2 in. horizontal line we find a percentage of 67 and subtracting this figure from 85% we have 18% of the total feed or 9 tons which is plus 2 in. and less than 2½ in. in size. Following the diagonal to the 1¼ in. intersection a percentage of 41 is found and subtracting this from 67, the product plus 1¼ in. and minus 2 in. amounts to 26% or 13 tons. Then again following the diagonal to the ¾ in. line we have a figure of 23%, which deducted from 41% gives 18% or 9 tons per hour plus ¾ in. and minus 1¼ in. About 7% is shown at the ¼ in. line, which means that 16% or 8 tons will be plus ¼ in. and minus ¾ in.



Crane for handling crusher parts. Clearances are given in Table No. 3

and 3½ tons minues ¼ in. This data would be tabulated as follows:

TABLE No. 2

Ring sizes of product produced when crusher is set to make 85% of the total feed of 50 tons per hour to 2½ in. ring size.

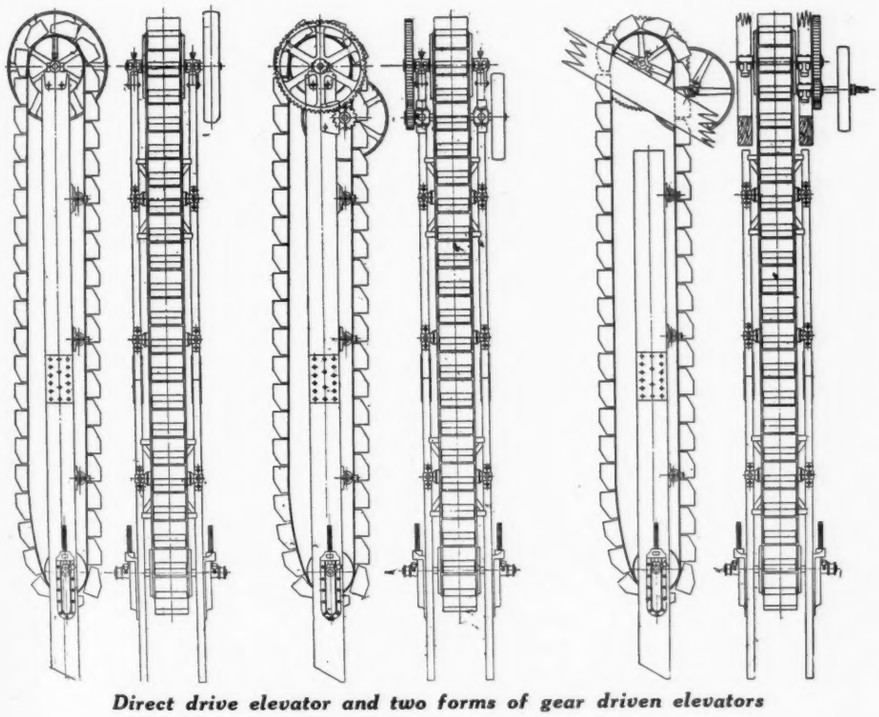
Plus 2½ in.	and minus 2⅞ in.	15% or 7½ tons
Plus 2 in.	and minus 2½ in.	18% or 9 tons
Plus 1¼ in.	and minus 2 in.	26% or 13 tons
Plus ¾ in.	and minus 1¼ in.	18% or 9 tons
Plus ¼ in.	and minus ¾ in.	16% or 8 tons
Minus ¼ in.		7% or 3½ tons
Total		100% or 50 tons

Arrangements for Repairs

It is quite natural to expect that repairs must be made to equipment and not to plan for making such repairs as may be necessary without undue loss of time during a busy operating season is a serious error. For a new installation or when remodeling an old plant this fact should be taken into consideration. More especially gyratory crushers should have a suitable hoisting arrangement so that parts may be easily and quickly changed. Table No. 3 is a typical diagram showing that a certain amount of clearance must be allowed for in order to properly take care of the various parts. A hoist of suitable capacity should be provided to lift the spider and also the main shaft with the head. Manufacturers of crushers will furnish the necessary information as to the weight of parts and also the clearance required from the top of the crusher to the hoist.

Elevators

While the use of elevators in stone crushing plants should be avoided as much as



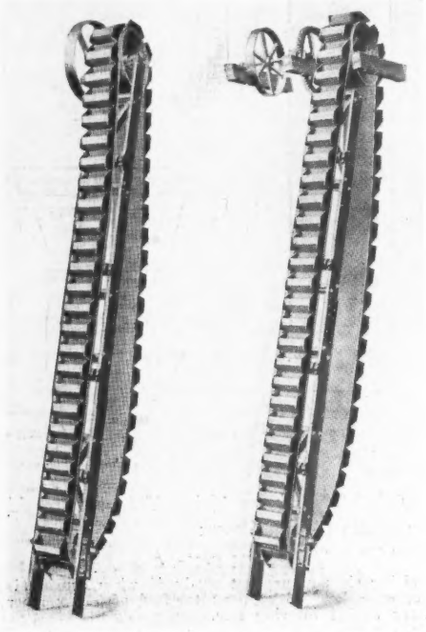
Direct drive elevator and two forms of gear driven elevators

TABLE No. 4—STANDARD SIZES OF ELEVATORS

Size (width of bucket	9 in.	11 in.	13 in.	16 in.	18 in.	24 in.	30 in.	36 in.
Bucket size, in.	9x6x9	11x6x9	13x6x10	16x7x11	18x8x12	24x9x14	30x11x15	36x12x18
Belt width, in.	10	12	14	18	20	26	32	38
Head pulley size, in.	24x12	24x14	24x16	30x20	36x22	42x28	48x34	54x40
Head pulley, r.p.m.	30	30	30	24	20	17	15	14
Boot pulley size, in.	18x12	18x14	18x16	20x20	24x22	28x28	32x34	36x40
Pinion shaft, r.p.m.	145	145	145	129	124	111	104	112
Capacity per hr., cu. ft.	866	1064	1272	1805	2314	3586	5300	7050
Capacity per hr., cu. yd.	32	39	47	67	86	133	196	260
Capacity per hr., tons	43	53	64	90	116	179	265	353
Hp. required, 30-ft. centers	2	3	3	4	6	8	12	16
Hp. required, 50-ft. centers	4	4	5	7	9	14	20	27
Hp. required, 70-ft. centers	5	6	7	10	12	20	28	38

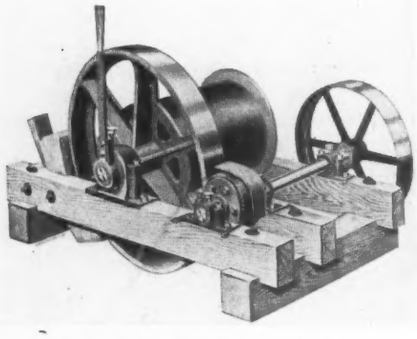
Bucket belt speed at 190 ft. per minute.
Capacity in tons based on material weighing 100 lb. per cu. ft.
All capacities figured at one-half of level full capacity.

possible, they must necessarily be used to a certain extent. Care should be taken to provide elevators with sufficient carrying capacity, as it is more economical to operate a properly loaded elevator than an overloaded one. The usual inclined belt type of continuous steel bucket elevator is illustrated herewith and table No. 4 lists some standard sizes. They are inclined at an angle of about 70 deg. from the horizontal, which is equivalent to a slope of 1 to 3. The belts are usually made of rubber and for long centers are provided with an extra rubber covering. The table gives the estimated



Direct and gear driven elevators

capacities with the usual inclination and based on a belt speed of 190 ft. per minute with buckets half full of material. To prevent an accidental reversal when loaded due to a sudden shutting off of power and spilling the material in the pit below, large elevators should be provided with a safety device which is inexpensive and can be easily attached to the driving pinion shaft. This device is automatic and requires no operating attention.



Simple hoist for pulling cars from the quarry level

A simple and common design of hoist for pulling the cars from the quarry level to the crusher level is shown on this page. It is of the friction type and very efficient for ordinary use. The lever attached to the drum shaft brings the pressure of the friction surface against the driving pinion or against the brake blocks as desired. If desired an operating shaft and lever may be placed away from the hoist so that the operator may have a full view of the track incline. These hoists are built in various sizes to suit the required loads.

Handbook of Material Handling Equipment

ONE of the most comprehensive handbooks both in detail and data on the various types of equipment used in handling rock products has just been put out by the Robins Conveying Belt Co., New York. The book of 272 pages is conveniently broken up into 14 sections dealing with the individual types in use. The entire work has been carefully compiled and is handsomely illustrated throughout. It is sure to be of interest to all rock products producers, for it contains a wealth of valuable and useful engineering data on equipment and installation.

Section 1. This is given over to complete details on belt conveyors and the equipment pertaining to them. Elaborate charts and tables have been compiled and are produced to help the individual producer to select the proper size and type of mechanical equipment and conveyor belt to be used to meet a specified use. In addition, instructions are given on the means of selecting the most practical and economical construction to fit the particular plant. All the equipment entering into the make up of a belt system, such as idlers, trippers, drives, takeups, etc., are given full consideration. There are also described several methods of installing and testing belts. Conveyors of the shuttle, portable and boom types are also described and discussed.

Section 2. A very general description of the uses, types, designing and engineering data on bucket elevators and buckets. It contains among other things methods for finding power requirements, tables and specifications for various types of buckets and a chart for use in derivation of the proper size of elevator to be constructed to handle certain volumes or tonnages of different material per hour.

Section 3. This describes in detail the methods and equipment to be used in storing, delivering and reclaiming coal for boiler house use. A graph and method are shown by which the capacity of a storage pile may be derived.

Section 4. Description, specifications and dimensions of crushers for coal and coke for ordinary and special use.

Section 5. The uses, application, construction capacity and advantages of dragline scrapers are discussed.

Section 6. The different types of feeders in general use are described and their uses, capacity and advantages given in detail with consideration to the particular industry in which they are to be applied.

Section 7. A general classification of grizzlies and screens and the uses to which they are put. Methods of selection of proper type are given and specifications, sizes and capacities of the various designs are given.

Section 8. Devoted to uses of hoppers and gates of different types. Includes description of these types and data on design and specifications.

Section 9. Deals with uses, design and equipment of skip hoist and bucket types for various purposes.

Section 10. Uses, types and methods of installing towers and bridges for different plant layouts. Two excellent designs are shown for laying out plants for economical and practical service from bridges.

Section 11. Covering in detail transmission machinery and equipment such as pulley gears, shafting, etc. Charts for finding ratings of involute and cycloidal gears, transmission pulleys and belts, shafts, etc. General description on design of this type of equipment.

Section 12. Describes uses, types and advantages of power and hand propelled weigh larries.

Section 13. A general consideration of winches, wheels and haulage equipment of power and hand type.

Section 14. Shows typical installations of Robins equipment in various industries.

Good Roads Convention in California

EXTENSIVE plans have been made for entertaining the large number of county supervisors that will come to Santa Monica, Calif., June 7 to 12 to attend the fourteenth annual convention of the United States Good Roads Association, to be held in conjunction with the Bankhead National Highway Association and the United States Good Roads Show.

Gov. J. Lee Trinkle, president of the association, and J. A. Rountree, director-general of the United States Good Roads Association, have sent out letters of invitation to over 1500 county supervisors in Montana, Arizona, California, Oregon, Washington, Idaho, Colorado, Wyoming, Utah, New Mexico and Nevada. Each county supervisor has been appointed a delegate to the convention.

Special plans have been made to make the convention particularly attractive to these delegates. Engineers and road builders will be in attendance from all parts of the country and will speak before the assemblages. Road material, road machinery, etc., will also be on display for inspection by those interested.

A special section of the program will be devoted to a meeting of county road officials and other county officers at which time their particular problems will be discussed.

Manor plant of the Charles Warner Co. at Tullytown, Penn. A new sand recovery system is to take the place of the steel tanks shown at the right

A Record of Some Editorial Visits East

Rock Products Manufacturers' Associations Busy at the National Capital—An Unusual Dredge for Florida Service

By Nathan C. Rockwood
Editor-Manager, Rock Products

A RECENT visit to the office of the National Lime Association, the National Sand and Gravel Association, and the National Crushed Stone Association at Washington, D. C., was convincing of the thorough and official manner in which these rock products' industries are now organized and equipped to render their members service. Some three or four years ago we illustrated in ROCK PRODUCTS the present offices of the National Lime Association, so we feel that members of the other two associations are doubtless equally interested in seeing what their Washington headquarters look like—hence the views herewith.

The offices of the National Sand and Gravel Association are in the Munsey Trust Co. building, facing on Pennsylvania avenue, a block or so from the New Willard hotel. The original office was established in this building several years ago, but the growth of the association and its personnel necessitated larger quarters recently, and these were obtained in the same building. The suite of rooms, including private offices for Secretary Ahearn and Engineer Walker, is attractive and businesslike, well suited to the purpose.

The offices of the National Crushed Stone Association are in the new Earle theater building, about two blocks down toward the Capitol from the Munsey Trust Building on the corner of Thirteenth and D streets, also overlooking Pennsylvania avenue. Engineer Goldbeck and Secretary Boyd have attractive private offices and another entrance office provides space for a reception room and stenographers.

Business was humming at both offices in anticipation of the opening of the freight

Main office room of the National Sand and Gravel Association

Library and office of the headquarters of the National Crushed Stone Association

V. P. Ahearn, Executive Secretary of the National Sand and Gravel Association

Stanton Walker, director of engineering and research, National Sand and Gravel Association

J. R. Boyd, Secretary of the National Crushed Stone Association

A. T. Goldbeck, director of bureau of engineering, National Crushed Stone Association

Penn Plant of the Charles Warner Co. at Tullytown, Penn. This was originally a dry pit operation, but the pit was allowed to fill with water so that barges could be employed for transporting the bank material in the place of cars. The incline was retained and the cars are filled from the barges by the derrick shown

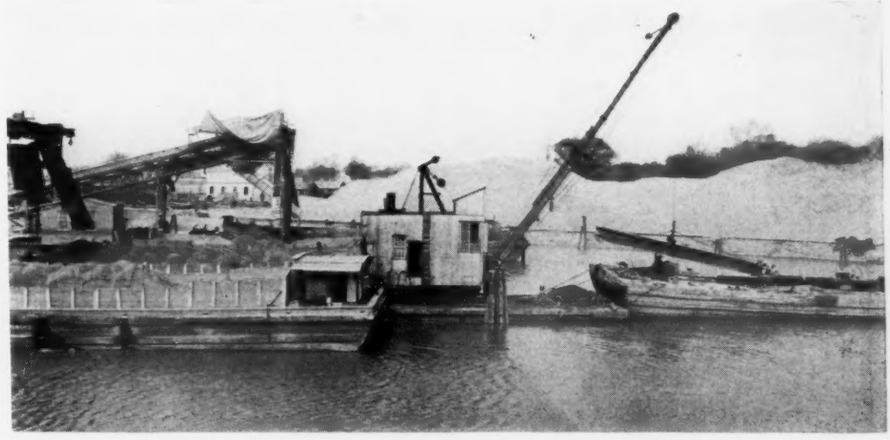
rate hearing before the Interstate Commerce Commission, when the final arguments on the now famous Western rate increase of 7½ cents per ton on aggregates will be heard. The common cause on freight rates and various concrete highway tests now being conducted in New Jersey and elsewhere, in which the two industries have equal interest is bringing about a healthful spirit of tolerance and understanding between the two associations, which cannot result in anything but good for all concerned.

New Dredge Under Construction Is a Floating Crushing Plant

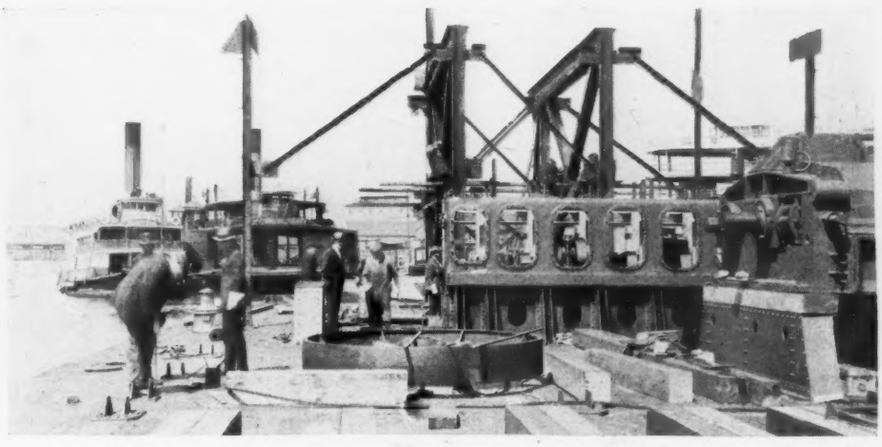
The Meteor Transportation and Trading Co. of Miami, Fla., which is associated with the Charles Warner Co., Wilmington, Del., is having built at Wilmington a dredge, *Magic City*, which is in many respects unique. It will work in Miami harbor and the bay on coral rock cast up by dredges which are engaged in deepening the harbor and channels. This rock will be picked up, washed, crushed and screened aboard this dredge, which can load four scows simultaneously. Eventually it may be necessary for the company to engage in underwater quarrying operations to supply the dredge with material.

The *Magic City* will be a ladder bucket dredge, powered with a 500 h.p. Worthington Diesel engine.

A part of the machinery, including the primary breaker will be belt driven, but a 150 k.w. d.c. electric generator will be direct-connected to the Diesel engine and the smaller machinery units will have individual motor drives. The main equipment consists



A feature of the Tullytown operations is the extent to which floating equipment is used. The picture was taken at the Manor plant



Bucket ladder frame on the deck of the dredge "Magic City"

of a primary crusher, which is the McLanahan single-roll crusher originally installed at the Bellefonte, Penn., plant of the American Lime and Stone Co., a Buchanan double-roll crusher, Flory hoists, and American Engineering Co. direct-motor-driven capstans. Altogether there will be 14 electric motors.

We shall have to postpone a more detailed description of this dredge until it is completed, but enough has been given to show that its equipment is unusual, and it is to be in some respects more like a floating crushing plant than the usual type of ladder dredge. Irving Warner is chief engineer of the company, and the general contractor is the American Car and Foundry Co.

Use Boats in Place of Cars

The Charles Warner Co., Wilmington, Del., are contemplating considerable changes in the method of sand recovery at their Manor plant near Tulleytown, Penn. In place of the present steel bins the sand will be chuted to timbered settling tanks on the waterfront, with the tops of the tanks at about water level. The sand from these tanks will be loaded into barges alongside the tanks by bucket elevators. This plant continues to be probably the most interesting in the sand and gravel industry, both from the nature of its construction and its very large capacity for a three-shift working day of 24 hours.

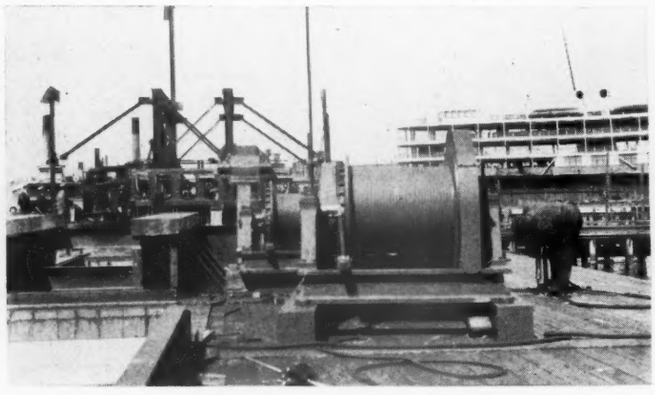
One thing that impresses the visitor to the sand and gravel plants around Tulleytown is the use of tugboats and barges for transportation, where in other localities railway cars and locomotives are used. Here, instead of trying to keep the pits pumped out, as is the case in most similar operations, they are allowed to fill with water. Then instead of steam shovels, or drag-lines, dredges are used for excavation and barges and tow boats for transportation. A good example is the Penn plant of the Charles Warner Co., which in the early days was a dry pit operation with the cars hauled up an incline. Without changing the main scheme of the plant, and still using skip cars on the incline, an elevated hopper is now supplied by a clamshell derrick unloading barge. This operation brings to mind some of those in the central west, where the pit is full of water and excavating is done by draglines on the edges of the pit, with transportation to the plant via a very roundabout railway track with short trains of a few cars each. A superintendent with marine experience could certainly lessen transportation costs at such plants.

Wrought Manganese Steel

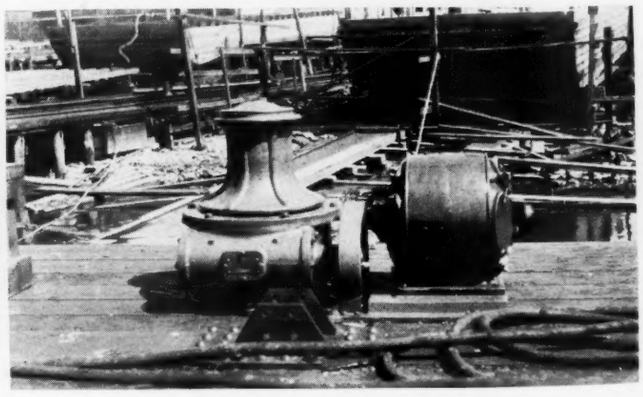
A visit in Philadelphia to the plant of the Manganese Steel Forge Co. was amply repaid by actual demonstration of great progress recently made in forging, punching, and working this most interesting steel alloy. This company has set out to learn to do everything with manganese steel that can be done with ordinary steel, and it is a real education to see what can be done with it, and what a variety of plant repair parts can be made from it. Wire is now drawn to diameters such that ¼-in. mesh screens are readily woven. A demonstration was given of the feasibility and practicability of welding manganese steel parts, with electric welding equipment, and even of welding manganese edges, lips and wearing surfaces on ordinary cast steel and cast iron. Users of manganese steel in the street railway and railway field are making practical use of manganese welding possibilities, but it is not generally known in the rock products industry that welding manganese steel is even a possibility. Punching, forging and shaping manganese steel has to be done, of course, while the material is at high temperature, and it has to be subsequently subjected to quick cooling to preserve the distinguishing properties of manganese steel, but these operations do not appear to present any unsurmountable difficulties to those who are making a study of them.

Activity In the Lehigh Valley

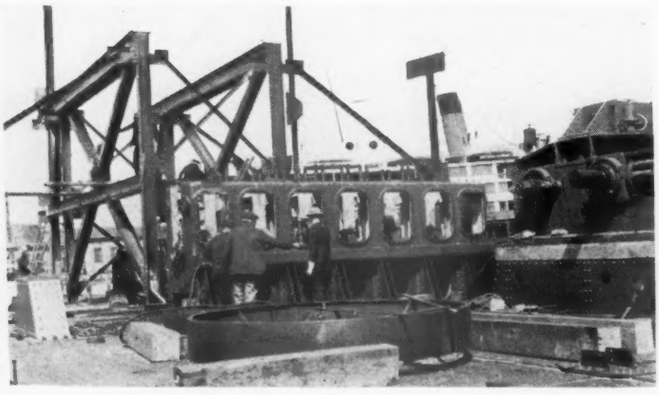
Various cement plants in the Lehigh Valley section of Pennsylvania and New Jersey are adding to their storage and packing facilities. While the general impression seems to be that production this year cannot now be expected to exceed that of 1925, every one seems to be fortifying himself with producing capacity amply able to take care of a very considerable increase.



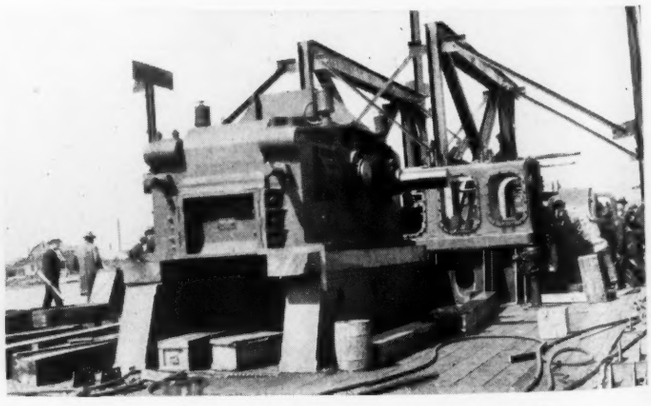
One of a pair of main hoists in the stern of the "Magic City"



One of the motor-driven capstans by which the dredge is maneuvered



Erecting the 500-hp. Diesel engine, which is the main power plant



The secondary roll crusher, which is erected on the deck

The Why, Where and How Much of Glass Sand

The Importance of Glass Sand in Our Daily Life and the Three Principal Glass Sand Fields of the United States

By Howard W. Elkinton
Philadelphia Quartz Co., Philadelphia, Penn.

INTEREST in glass sand depends upon the interest in glass. Very little observation is necessary to convince one of the widespread use and fundamental importance of glass in present day civilization. The room in which I am writing represents twenty different uses of glass. This hasty inventory from paper weights to electric light bulbs reveals at a glance the extraordinary utility of glass and glass products in every-day life. Such a review always brings surprises, especially in a room where furnishings are, of necessity, spare. The doors might have been equipped with glass knobs; they are wood. A camera with photographic plates might easily have illustrated the basic importance of glass in photography. A good hand magnifying glass would represent the marvelous use of glass in optics. The lens of the telescope has revealed the most distant star and permitted man to count the mountains on the moon. The lens of the microscope has given us insight into the tiny structures of matter. Microscopy and photography combined have made it possible to see the activity of the atom. Nor must we forget the good old magic lantern and the modern picture show projector that permit us to throw pictures on the screen so that the folks can see what we are talking about.

Glass is made from sand. That is, sand provides the necessary silica (SiO_2) which combines with sodium carbonate and lime to make the usual glasses of commercial use. The important thing to bear in mind is that all glasses are silicates, or, to put it simply, silicon dioxide in combination with some other element or elements. Silica (SiO_2) is most readily available to commerce as sand because nature has diligently reduced the larger rocks to granules and through the sorting process of wind or water placed them in deposits where they can be had by the glassmaker. If it were not for the many and abundant deposits of sand the world would have little glass, as the reduction of silica would be too difficult from other sources. It is the sand that nature has made so accessible that contributes so much to the glass industry.

The subject of this paper is glass sand, consequently it is necessary to omit sand in general from our further consideration. Most sands contain chemically and physically some contamination. The sea shore sand, in addition to the driftwood and old bottles tossed up by the sea, contains matter that makes it uninteresting to the glassmaker. Black specks occur in it which are usually identified as oxides of titanium or iron oxides of titanium, usually known as titanates. On the Jersey coast such contamination is widespread and the grains are ilmenite, brookite, or rutile. In addition there are tiny grains containing iron in various forms. Iron spoils sand for the glass maker. It turns glass green and generally interferes with production, so that trade custom has named that sand glass sand which has less than one-half of one per cent iron content. A discriminating trade insists on sands of an iron content less than one-tenth of one per cent. There are glass sands available in large areas containing as little as two hundredths of one per cent. A typical analysis is:

Silica (SiO_2)	98.96%
Iron oxide (FeO)	.02%
Alumina (Al_2O_3)	.52%
Titania (TiO)	.03%
Lime (CaO)	.27%
Magnesia (MgO)	.06%
Ignited loss	.14%

We shall next consider where these deposits may be found and how they were laid down. In this paper we can cover three fields from which glass sand can be obtained in the United States: the New Jersey field, the western Pennsylvania field and the central Illinois field. Sand of great purity, that is, of low iron content, can be found in other parts of the country and the geological formations that make sand available in the territories specified carry through to other sections. The sand formations in New Jersey can be duplicated to less degree in the state of Delaware, especially in the Chesapeake region, or wherever the sea covered and retreated over an area during relatively recent geologic times. The important thing to bear in mind is that such sections are the wastes of older land areas and mixed in character. Where the sea has sorted and washed the sand to a particular purity it invariably left the deposit as a bank or as a lens. The south Jersey deposits lie as great lenses anywhere from a few feet to 100 ft. *beneath the soil.* Mining such sands always means struggling with an overburden of greater or less thickness and lifting the sand out of a hole to the

Magnified quartz crystal showing characteristic striae and conchoidal fractures

washing and drying machinery on the surface.

The deposits of central Pennsylvania are fundamentally different. Glass sand is produced in this area from the Oriskany seam of white sand stone that appears as an outcrop in the southwestern part of the state and also continuing into western Maryland and eastern West Virginia. As a matter of fact the original Oriskany sea, on the floor of which a fine bed of white sand was distributed many millions of years ago, stretched as a great finger from the St. Lawrence region in a southwesterly direction as far as Alabama. This sea received the waste from land masses to the east. Naturally the floor of this varied in its character, but a surprisingly large section consisted of a fine white sand which was later covered by deposits and finally tilted and turned by earth movements that created the Allegheny mountains. Today this sandstone appears in seams. If a sheet of paper were laid between sheets of cloth, then pressed from the sides and crumpled into ridges, then the seams of the ridges cut off, one would see the seams of paper as one sees the sand. It is evident that these Pennsylvania formations are fundamentally different in structure from the Jersey sands. The pressures on the Oriskany seams have been sufficient to press the sand into a sandstone, so that it is necessary to crush the stone to reduce it to sand sized for the trade. Sands from this source are exceptionally pure due to the washing and sorting of nature on the floor of the Oriskany sea during the Devonian period.

The sands of the Illinois field illustrate a splendid preparation of sorting and washing by the sea, another sorting by the wind and a final washing by the sea, with deposits left near the surface. Outcrops of this same sand appear in Missouri. Sands of these deposits are identified with St. Peter's time. Geologically this places them in the Ordovician age. To understand the formation readily one must consider the interior of the United States as a sheet slightly raised at the north. At times of depression the ocean, always of relatively shallow depth in the interior sea, advanced as far as southern Wisconsin and to the east across what is now southern Canada and back to the south along the western shore of the Appalachian uplift. At times of elevation of the sheet during mid-St. Peter's time it retreated to a line extending from the middle of Texas running east and west through Kansas and extending obliquely to the southwestern corner of New York and withdrawing to the south on the same relative line. By the end of St. Peter's time the sea had re-extended to the north again. These conditions of advance and retreat were almost perfect for the development of a beach first thrown up by the sea, then sifted by the winds as dune-sand, then, upon the sea's final advance thoroughly washed so as to remove the dust that accumulated in the desert formations. Finally nature left these sands almost undisturbed.

Sand grains magnified under the microscope showing fracture and wear

Aside from geology the physical characteristics of these several sands tend to support our conclusions. Jersey sands under the microscope show the irregular and "cracked" condition of sand from this district. There are evidences of relatively little wear. The variety of the size of the grains shows a short life in sand, as moving and tumbling objects tend toward uniformity in size. The small grains disappear and the large grains are reduced. But the best evidence of youth is the concavity of the grain sides. One strong characteristic of quartz or silica is the concoidal fracture or shell shaped cleavage that results when pieces of quartz are broken. Young grains show this tell-tale fracture, under the magnifying glass, with convincing force. The grains of Illinois sand are almost a perfect sphere. Only one thing could cause such roundness, the incessant tumbling and rolling, first by water, then by wind, and finally by water. The study of sand grains under the microscope can reveal much of their past life. One can see at a glance whether the sand is "young" or "old" as the experience and buffeting of the years will leave its mark upon each grain.

The value of glass sand is, of course, subject to the influence of the twins of commerce, demand and supply. Sand is found in abundance in the earth. Its quality depends upon the treatment of nature as we have seen. The processing that is done by the producer to prepare it for the market is really a refinement of the treatment rather than a manufacture. Processing of sand merely removes impurities. Washing and drying do not change the nature of the material. As a matter of fact, tons of sand are used annually with no treatment whatsoever except to be shifted from the sand bank to the point of use. With glass sand there is always the cost of a certain amount of treatment. In Jersey this is the cost of lifting the sand by water pump to the washer

Different sand in individual bottles arranged to give an idea of their purity on a basis of iron content

and passing through the dryer to the storage bin. Occasionally there is the added cost of separation of ferric and titanium impurities. In Pennsylvania, where the sand has to be crushed, there is the cost of crushing before grading and also the cost of separating, if the mechanical wear of the heavy machinery introduces too much iron. In Illinois the processing costs of glass sand are exceedingly low. The sand rests near the surface; it is of fine quality, as we have observed, and large production machinery reduces the cost per ton to a minimum.

Cost of Preparation

It is evident that the cost of preparation is the dominant feature in prices that range from less than $1.00 to $3.00 per ton at the pits. The actual mined quality is never under the control of the miner, and for this reason the producer has the choice of shifting position, finding a fresh deposit, taking less for the sand or deserting the field. The very nature of sand as a material that is taken out of the earth means that the far sighted producer is always in search of new deposits and better fields. The value of sand to the glass sand industry must include, over the long swing, a certain amount of prospecting. Mines are continually running out and pits are in the process of exhaustion so that development of new sources is imperative. It is very seldom that a producer can sell a sand of a lesser quality for a lower price as the consumer usually wants a commodity of specific minimum fineness below which he must not go for fear of affecting his product. Bargains and job lots in the glass sand business are rare. Although it is possible to treat off-quality sand at the delivery point, the whole tendency for the consumer is to eliminate such special costs and either insist on a better sand from another deposit or buy elsewhere. This is an unfortunate characteristic of any raw material that is dug from the earth.

The economic value of glass sand is always influenced by the number of producers in a given field and the number of consumers that draw from the field. The price will always fluctuate as the bulls and the bears struggle in the sand pit. Another very important factor is freight. Sand is a heavy commodity which requires a heavy charge for the freight haul. As a consequence, the freight rate structure of the country has a very real effect on the delivered price of glass sands. A variation of a few cents per hundred pounds may permit a producer to embrace or desert a given market. No producer should venture the investment of capital in the production of glass sand without a very careful study of freight rates to his prospective customers. The salvage value of sand mining machinery is meager compensation for such neglect.

Railway Engineers Discuss Washed Gravel Ballast

Adapt the Specifications Presented at the Atlanta Meeting of the National Sand and Gravel Association and Discuss Weight vs. Yards

THE existing specifications for washed gravel ballast were adopted at a time when the use of such material was comparatively new. It was recognized by the Committee on Ballast that it was an imperfect specification and with a view to learning the feeling in regard thereto, the sub-committee sent out the following questionnaire to the railroads:

1. Should the amount of sand which is permitted by the specifications be changed?
2. What per cent of gravel should there be between ½ in. and the No. 10 screen?
3. Is it desirable to lower the maximum size from 2½ in. to 2 in.?
4. Should the per cent of large aggregate between the maximum size and 1 in. be limited to some particular per cent of the total volume?

Replies were received from 33 railroads using gravel ballast and these indicated a change desired.

A Test for Soundness Wanted

It is recognized by the committee that gravel may be well washed, well screened and well graded and yet be practically worthless as ballast because of its lack of resistance to disintegration and wear. Some work has been done looking towards the development of a test for "soundness." As yet nothing has been developed that can be put into practice, but it is hoped that in the next report such a test will be in shape to present for consideration.

In view of the information developed by the questionnaire referred to above and from other sources, the committee proposed the following:

AT the Atlanta meeting of the National Sand and Gravel Association specifications for washed gravel ballast, which had been drawn up by the ballast committee of the association in cooperation with the ballast committee of the American Railway Engineering Association, were presented and adopted. At a recent meeting of the American Railway Engineering Association the ballast committee presented the same specifications which were adopted, thus making them standard for the United States. A discussion on the method of purchase (whether it should be by tons or yards) followed, but it led to no change in the specifications. The report of the railway engineers meeting is reprinted from the magazine Railway Age—Railway Engineering and Maintenance.

The Standard Specification Adopted

Gravel for ballast shall be so prepared that all dust, dirt and loam are removed, that all aggregates that will not in every position pass through a 1½-in. ring are either rejected or crushed and returned to the ballast and that the resultant product conform to the following:

Where the percentages of crushed material runs between nothing and 20, the ratios of various sizes of aggregates to the whole shall be as follows:

1/10 to ¼ in.	min. 25% max. 40%	½ to 1 in.	min. 20% max. 55%
¼ to ½ in.	min. 20% max. 30%	1 to 1½ in.	min. 0% max. 35%

Where the percentage of crushed material runs more than 20 and less than 40, the ratios of various sizes of aggregates to the whole shall be as follows:

1/10 to ¼ in.	min. 10% max. 30%	½ to 1 in.	min. 20% max. 60%
¼ to ½ in.	min. 20% max. 35%	1 to 1½ in.	min. 0% max. 50%

Where the percentage of crushed material is more than 40, the ratios of the various sizes of aggregates to the whole shall be as follows:

¼ to ½ in.	min. 20% max. 25%	1 to 1½ in.	min. 5% max. 55%
½ to 1 in.	min. 25% max. 60%		

Testing for Silt

A sample of the prepared ballast containing ⅛ cu. ft. shall be placed in a watertight receptacle having a capacity of not less than 1 cu. ft. Into this receptacle shall then be placed two quarts of clear water, after which the receptacle shall be drained off immediately and placed in a glass jar and allowed to settle. If the sediment deposited in the

bottom of the jar is more than ½ of 1 per cent of the sample, as determined by weight, the output of the plant shall be rejected until the fault has been corrected.

A sample weighing not less than 150 lb. shall be placed in or on a screen having round holes 1½ in. in diameter. If a thorough agitation of the screen fails to pass through the screen 98% of the material, as determined by weight, the output of the plant shall be rejected until the fault has been corrected.

One cubic foot of the prepared ballast shall be thoroughly dried, weighed and placed in a screen having ten meshes to the inch and the screen agitated till all particles which will pass have passed through the screen. If the material which passes through the screen exceed 2% of the original sample, as determined by weight, the output shall be rejected until the fault has been corrected.

Inspecting and Weighing

Inspection—In case inspection develops the fact that the material which has been or is being loaded is not in accordance with these specifications, the inspector shall notify the manufacturer to stop further loading until the fault has been corrected, and to dispose of all defective material that had been loaded in cars, which shall be done at the expense of the contractor.

Measurements—When ballast is being paid for by the ton, and it is impracticable to weigh each car, the weight per yard shall be obtained by weighing at frequent intervals not less than five cars loaded with ballast, the contents of which have been carefully measured. The weight per yard obtained by such a test shall be used in figuring the weight per car until another test is made.

When ballast is paid for by the yard, the amount shall be determined by weighing each car, where practicable, and applying the weight per yard as determined by frequent tests. When impracticable to weigh each car, the contents of each car will be carefully estimated by comparison with cars, the contents of which have been actually measured.

Conclusions

It is recommended that the specifications for washed gravel ballast now appearing in the manual be withdrawn and that the revised form prescribed herewith be accepted as a tentative specification with a view to its adoption as recommended practice one year hence.

Discussion

Chairman Stimson then moved the adoption of the revised specifications for washed gravel as tentative specifications with the addition of a paragraph headed "Uniformity" to read as follows:

"The finished product when loaded in cars must have the various sizes of aggregates uniformly distributed throughout the whole. Any segregation of the aggregate which, in the judgment of the engineer, will lessen the value of the product as ballast, will be cause for rejection."

One Engineer Prefers Yards to Tons

H. M. Stout (N. P.): The committee has provided in the previous specification, which is continued in this report, a measurement by the ton. I think that that specification or that way of measuring ballast should be discouraged as much as possible. The usual engineering rule for measuring ballast is the cubic yard, and I think it is against the interest of the business to confuse this point by producing or maintaining numerous units.

During the federal valuation of the railroads, all the yardage, probably, was included on the basis of cubic yards, and provisions of the Bureau of Valuation under their Order No. 3, provides that the unit designations, the quantities and descriptions recorded in the completion reports and in the record of property changes shall be stated, so far as possible, in the terms of the inventory taken by this commission.

Chairman Stimson: I would call attention to the fact that the paragraph on measurements does not limit it to measuring the ballast by the ton. It provides for measuring it by ton if that is the unit of measure under which the ballast is purchased.

It is a matter of record and common practice that ballast is very generally bought by the ton, as that is the easy way to make a ready measurement.

The weights are obtained for transportation purposes and are easily applied in ascertaining the amounts to be covered by the invoices. While I have no question at all in my mind that the yard is the unit which will be used in the records to which reference has been made, I can see no inconsistency in the rule as given here in this specification which, as I have said before, merely recites what everybody knows—how to reduce tons to yards and yards to tons.

Effects of Bulking

C. C. Westfall (I. C.): The concrete engineers have brought out a point in the last few years on the bulking of wet sand which is thrown loosely into a pit. I believe in buying sand it might be well to make a study of that and possibly arrive at the methods of measurements based on price.

Chairman Stimson: The new specification is set up with a view that all sand will be removed, and that the only sand that is tolerated in the specification is that which has been demonstrated from the operation of pits is impossible to get rid of in a reasonable commercial way.

The test for the sand requires that the material be dried and that the sand that is found shall be measured in that way, and the limit is set at 3% as being the maximum that will be permitted. I think that any variations that might be due to wetness or dryness of the sand can well be entirely ignored.

President Fairbairn: Mr. Stout, do you have a change to suggest in the two paragraphs under the caption of "Measurements?"

Mr. Stout: I had no change formulated. My thought was to bring the matter before the committee.

(The committee was dismissed with the thanks of the association.)

Specifications for Slag for Use as Aggregate

THE following specifications for slag for use as concrete aggregate have been recently adopted by the Engineers' Society of Western Pennsylvania:

Slag shall consist of air-cooled blast-furnace slag of tough, durable pieces, non-glassy in character. Dried slag, when tested according to the methods of the American Society for Testing Materials, serial designation C 29-21, shall weigh not less than 70 lb. per cu. ft.

Coarse aggregates shall be divided into three classes, and when tested dry with Tyler standard sieves, the per cent retained on sieves shall be within the following limits, by weight:

Small, suitable for reinforced concrete or concrete in thin walls or small volumes	
On a ¾-in. sieve	0 to 5
On a ⅜-in. sieve	30 to 70
On a No. 4 sieve	95 to 100
Medium, suitable for mass or reinforced concrete	
On a 1½-in. sieve	0 to 5
On a ¾-in. sieve	30 to 60
On a ⅜-in. sieve	85 to 100
Large, suitable for mass concrete	
On a 2½-in. sieve	0 to 5
On a 1½-in. sieve	15 to 40
On a ¾-in. sieve	25 to 75
On a ⅜-in. sieve	85 to 100

Rock Dusts Not So Harmful to Breathe

WRITING in the *Chicago Tribune*, on the effect of breathing dust, Dr. W. A. Evans says:

"Some part of the inorganic dust is also harmless, or seems to be. For instance, the lime dusts are said to be nearly harmless, the reason being that lime is soluble. When it gets into the lungs the fluids there dissolve it, whereupon it is either expectorated or absorbed and carried by the blood to those excretory organs which throw it out of solution.

"The sand or silicon dusts are the most harmful next to certain iron dusts and kinsmen of that dust. But not all the silicon dust or sand dusts are extremely harmful. To qualify in the very bad class a given dust must contain a heavy proportion of silica. A good part of that substance must be free silica and not silica colloids. And, finally, the dust particles must be smaller than a red blood cell.

"Dr. Salls of the New York State Department of Labor has devised a method of determining the harmfulness of sand dusts. He publishes a list of 47 dusts of which the following are not very harmful: Glass sand, granite dust from a cyclone separator, fresh sand from a sand blast foundry, sand for glassware, granulated quartz, construction sand, china clay for enameling porcelain, sand paper flint."

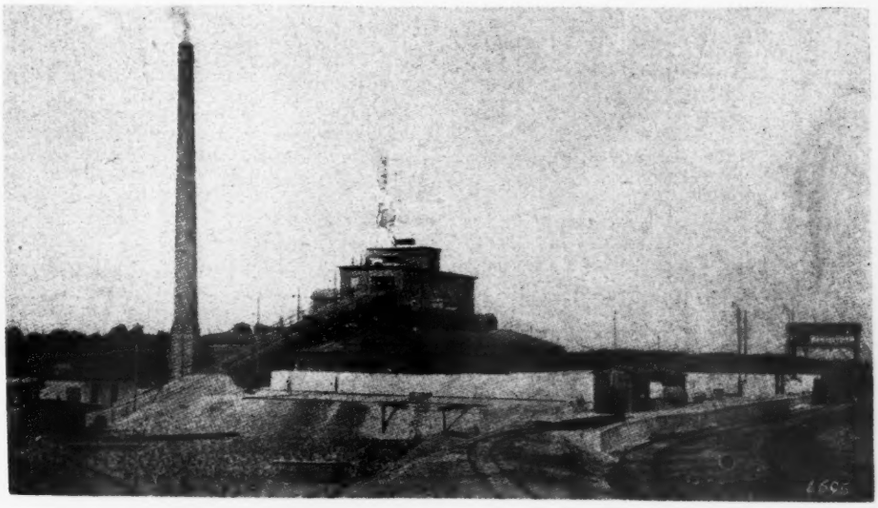
A Modern German Sand-Lime Brick Plant

Lautawerk Plant of the United Aluminum Corporation, Germany, Produces Over 36,000,000 Brick Per Year

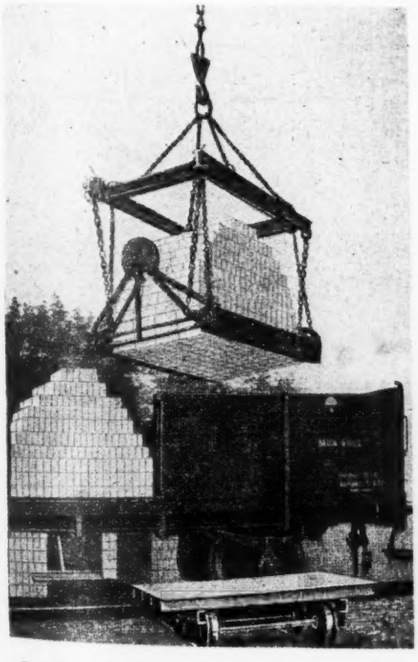
THE manufacture of sand-lime brick in Germany is fast becoming one of the large industries in that country. It is not surprising to find that because of the efficient methods of manufacture through modern machinery and equipment they are able to export large quantities to the United States to compete with American products. The *Tonindustrie Zeitung* has recently published a description of one of the large German plants and because of the general excellence in design we are printing the following translation.

The plant is known as the Lautawerk and is a part of the immense works of the United Aluminum Corporation of Germany. The greater part of the factory buildings of this corporation were built during the war, and to supply the brick for their construction the sand-lime brick plant was built. The plant operated at first with two mixing drums and two presses, but after the war additional equipment and two more presses were added, thereby increasing its output to 36,000,000 brick per year. The changes in design and most of the additional equipment were made by the F. Komnick Co.

The excavated sand is loaded into dump cars and hauled by locomotive to the plant and up an incline track to the top of the structural work where the cars dump into the large storage silos located directly over the mixing drums. The lime, previously ground in a ball mill is carried by bucket conveyor to the lime storage silo which is located above and between the sand silos. These storage bins are all above the mixing drums.



Sand-lime brick plant of the United Aluminum Corp. of Germany



Loader about to place the entire and regular load of brick into the railroad car

The desired amount of sand is then drawn from storage into the mixing drums. The lime passes through an automatic weighing device and is discharged through a hopper into a screw conveyor which carries it to the mixing drum. The drum cover is now fastened and a measured amount of water added to slake the lime and the drum set in motion to mix the ingredients thoroughly. When the process is deemed complete the drum is stopped and the ingredients discharged into a hopper. From this hopper it is passed by means of an automatic distributing device to an edge runner mill where the sand and lime are rubbed into each other thoroughly. The mass is then carried by bucket conveyor over a shaking screen where the lumps, foreign matter, etc., are removed and the clean product allowed to go to the presses and there made into brick.

The uncured brick are then piled on trucks and carried into the hardening cylinders. There are nine of these cylinders in use at the plant, each about 18 meters (60 ft.) long and 2 meters (6 ft. 8in.) in diameter. After 9 hours the cylinder ends are opened, and the loaded trucks with the now hardened bricks withdrawn by attaching a portable cable to the truck train ends. Steam for the hardening cylinders is generated by two duplex fire-tube boilers. One of these boilers is always ready for use. All machinery is operated by electric motors on current bought from a local power company. Shipments are made either by truck or by railroad, dependent on the destination.

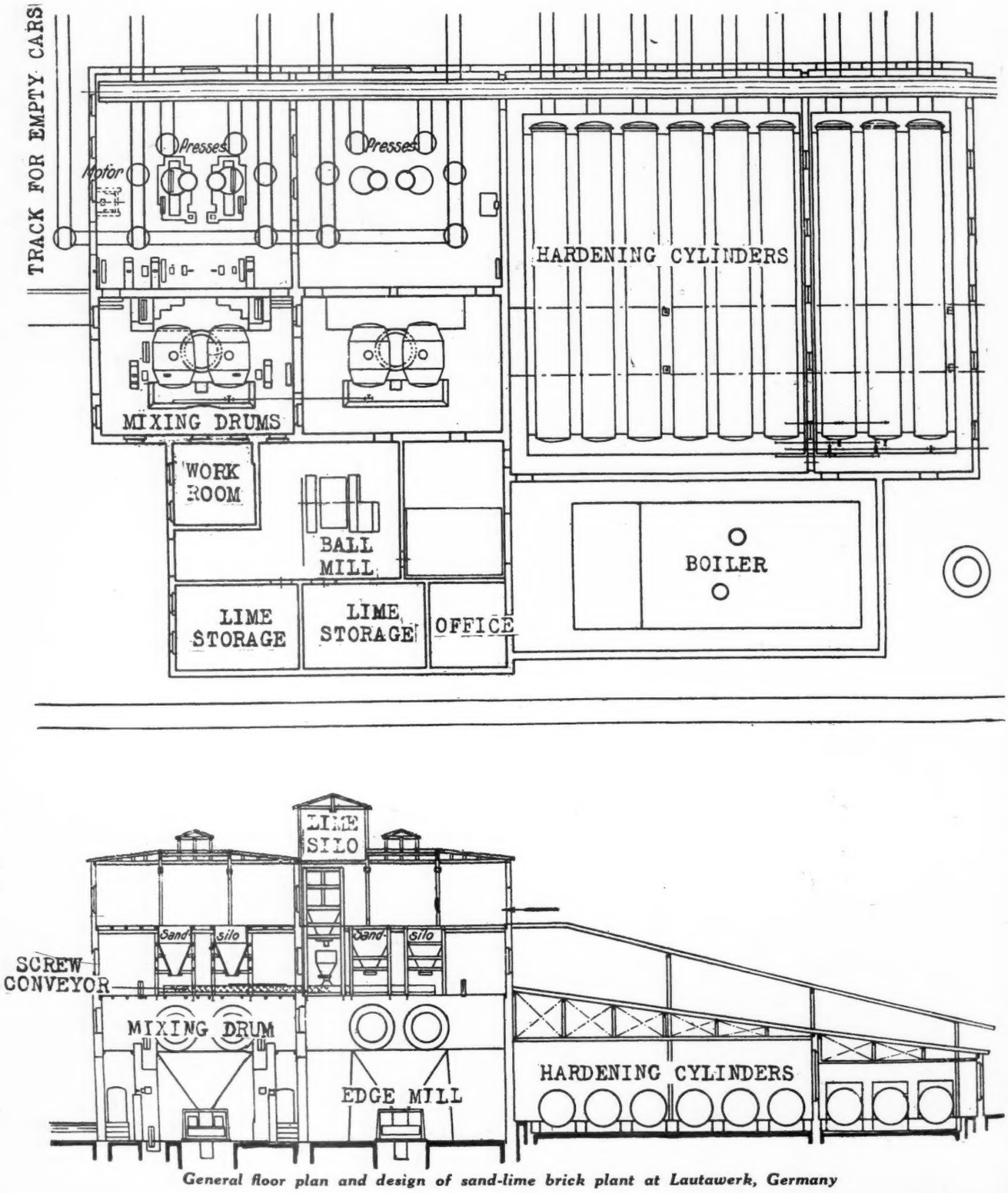
The loading of the finished brick into railroad cars or other carriers is by means of an electric hoist to which a hoiding device called a "Gripper" is fastened. The loosely piled bricks are drawn on the track to the edge of the car to be loaded. The bricks are there forced together by a pressure apparatus. The hoist with the "Gripper" is then brought directly over the truck and lowered. The "Gripper" consists of two steel frames, connected by inner and outer

Loading device brought into position over the truck piled with brick

chains. The outer chains are loosened by turning a hand screw and as the upper steel frame is raised the inner chains, which are fastened to winches, are set in motion. As the winches turn these inner chains are tightened and cause the lower frame to press the lower tiers of brick together and act as a sort of carrying floor. The pressure which is put on the brick is determined automatically by the weight to be raised. Thus the operator is reasonably certain that the frame is tight and impossible for the load to slip after lifting has begun.

The load is now raised and swung over on to the car by the electric hoist. When the lower tiers of brick are in firm contact with the car floor, the steel frame enclosing them is released automatically and the entire load deposited there in a neat pile. The "Gripper" can then be swung free from the pile and be brought into position for another load.

In addition to supplying the Aluminum Corporation with all the brick needed for different purposes at the plant, a great many of the houses in the town and neighborhood are built with them. An example of the widespread use is in the construction of two churches at the village, both of which were built of sand lime brick. These compare very favorably in appearance even with older churches in the locality which were built of carefully selected stone.



General floor plan and design of sand-lime brick plant at Lautawerk, Germany

Evolution of Lime Kilns in France

How the Internally Fired Kiln Reached Its Present Efficient Design in Forty Years of Progress

By J. E. Duchez
Consulting Engineer, Albi, France

Abstracted from an article in the French Revue des Materiaux de Construction

THE earlier lime kilns (built before 1885) used wood for fuel and were built without other principles of design than those gained by experience or the personal notions of the builder. The fireplace for wood was placed under the kiln and when long flame coal began to be used as fuel, fireplaces for coal took the place of those for wood. To

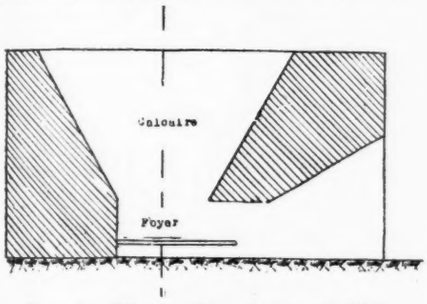


Fig. 1. The earlier form of kiln, which was practically the only kiln used until 1885

increase the production someone put layers of fuel between layers of limestone in the upper part of the kiln and to avoid losses in heat a revetment, or covering, of clay was placed over the charge after the manner of covering in kilns for burning charcoal from wood (see Fig. 2). From this revetment grew the forms of masonry construction which gave the kiln the form (Fig. 3) which one finds today in actual use. (Furnaces of almost this type are still used in Florida and some other parts of the United States.)

In these earlier types the fireplace was put

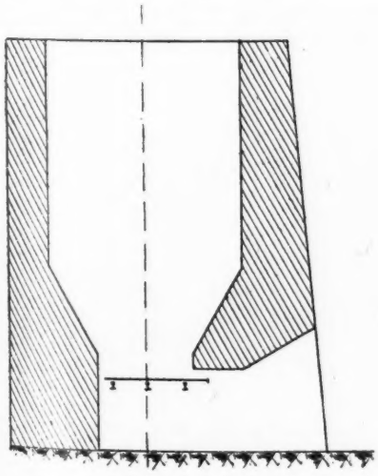


Fig. 3. The first step was to increase the height

THE modern lime kiln has developed in the last forty years. In France the internally fired kiln has been a favorite on account of the favorable fuel ratio obtainable with this type, using coke or anthracite as fuel. The development has been so marked in France that the modern forms are called "French kilns" in some other parts of Europe. It is the evolution of this type of kiln that is described in this article.

In the United States, where fuel economy did not seem to kiln designers to be of so much importance, and where there was a constantly increasing demand for a cleaner product, the direct fired kiln has received less attention than the kiln which is exteriorly fired with producer gas or solid fuel.

It is well worth noting that to reach its present development the lime kiln had to borrow ideas from other industries. The idea of covering in the charge to conserve heat came from charcoal burning; the shaft form and the regulated draft came from the furnaces for smelting iron. The recovery of waste heat also came from the metallurgical field. As a result of study and the application of known engineering principles the modern lime kiln stands on a par with the best of industrial furnaces.

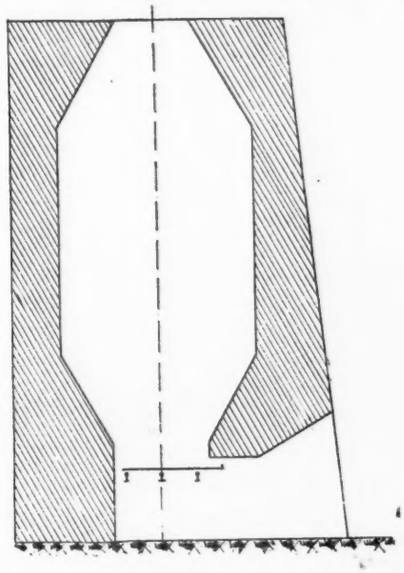


Fig. 4. To save heat the charging opening was made smaller

below the kiln to insure the burning of the entire bed of limestone. With increased height intermittent burning has been changed to continuous burning and the furnace below has been suppressed.

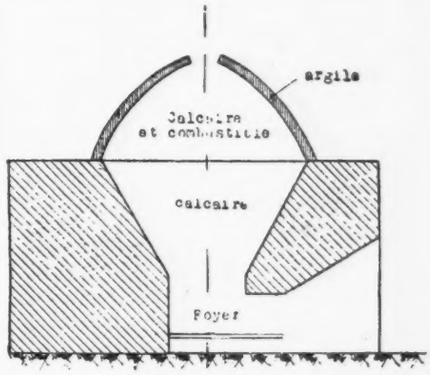


Fig. 2. A covering of clay was used to save heat. From this grew the masonry structures used

The first step of progress was avoiding a great loss of heat through the open top. The "ovoid" form of kiln (Fig. 4) became the "biovoid" and the charging opening was made of less diameter than that of the belly of the kiln.

In 1885 kilns of upright cylindrical form began to appear and even those of the form of a truncated cone with the greatest diam-

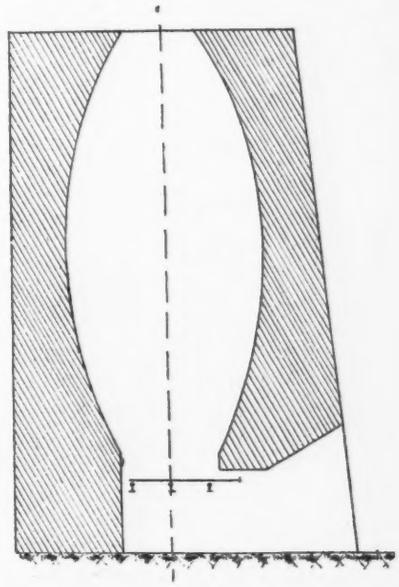


Fig. 5. The form in Fig. 4 developed to the "biovoid" shaft form

eter at the base (as shown in Figs. 6 and 7).

At first kilns were placed against the quarry with the top at the height of the quarry floor to make charging easy. Such kilns had only one opening for discharge. In flat countries where the kiln could not be placed in this way kilns with more than one discharge port were built to avoid the uneven descent of the material which came from drawing from one port.

The greatest height of furnaces did not exceed 12 m. (39 ft.) until 1900, but after that kilns were built larger and higher and the large kilns were preferred on account of the increased draft. With more draw ports and more draft the working of the kiln was more regular and the fuel economy was greater.

The writer does not wish to decry all types of kilns resembling those described, but the best they could do was to burn a (metric) ton of quicklime with 280 to 300 kg. of coal (a ratio of 3.3 to 3.5 to 1) and with 200 kg. for hydraulic lime. The daily production of a unit rarely exceeded 10 or 12 tons.

Then the kilns shown in Figs. 6 and 7 were equipped with stacks to increase the draft (Fig. 8) and gratings were placed in the lower part to cool the burned lime and keep the fire from coming down (Fig. 9).

kg. per ton on quicklime and 150 kg. on hydraulic lime. (Ratio of 5 to 1 and 6.6 to 1.)

In the interval between 1885 and 1895 builders sought to utilize knowledge gained in metallurgy. Kilns appeared (Figs. 12, 13 and 14) in which the air required for combustion was preheated by passing it around the jackets of the kiln. The earlier types of these lost the advantages of the types equipped with the plunging stack (Fig. 11)

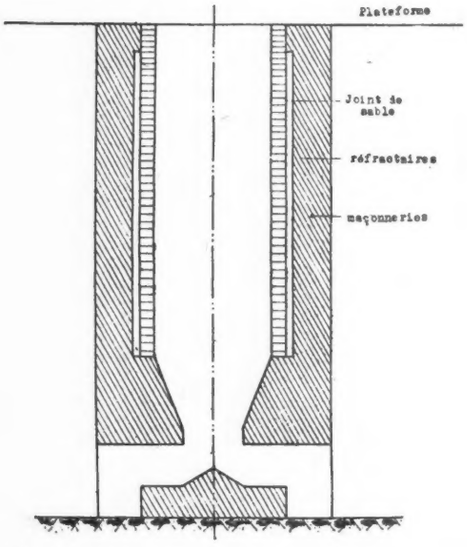


Fig. 6. In 1885 the first shaft kilns of straight section were built

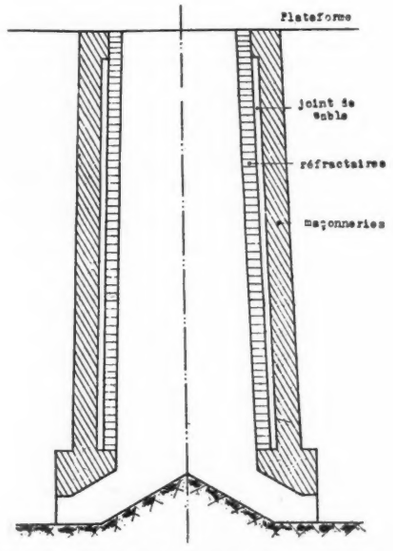


Fig. 7. The shaft was made larger at the bottom to prevent sticking

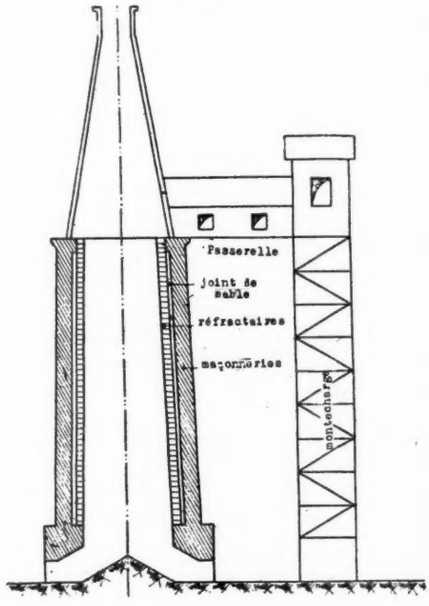


Fig. 8. The kiln was next equipped with a stack and an elevator for feeding

There was a kiln in Russia at this time which had an excellent fuel economy (Fig. 10). It was equipped with a "plunging" stack (that is, brought down below the top of the furnace). In 1903-05 there appeared a kiln which used the principles shown in Figs. 9 and 10 in combination. With the proper dimensions this produced 20 to 30 tons per 24 hours with a fuel consumption of 200

and it was not until 1919 that the greater number of designers adopted the plunging stack.

The types of kilns in use today are hence derived from the kiln shown in Fig. 11 by adding the plunging form of stack to the

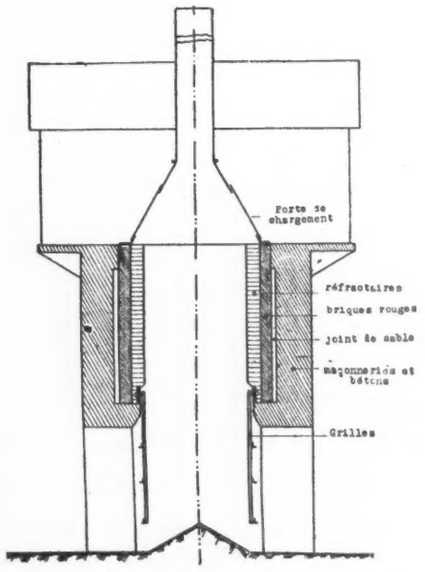


Fig. 9. The next addition was a "grille" (grating) to cool the burned lime

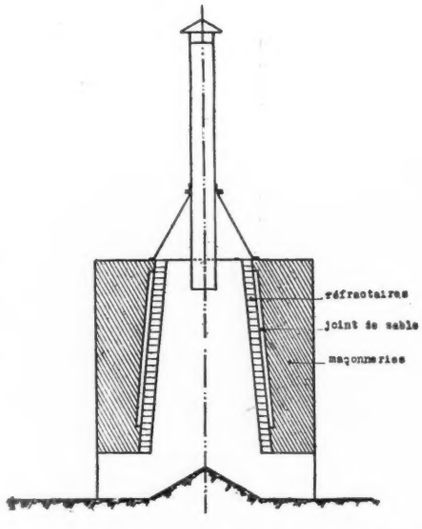


Fig. 10. A Russian kiln with "plunging" stack showed high fuel economy

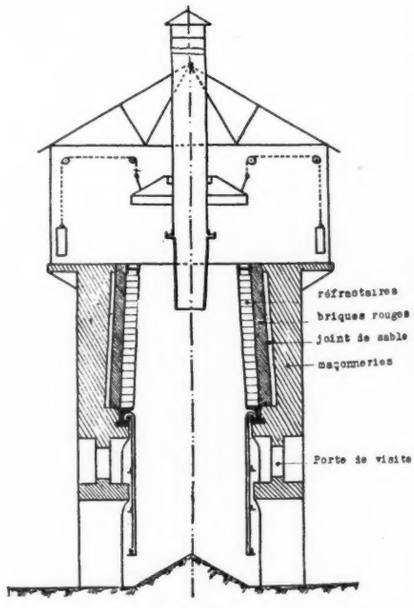


Fig. 11. The kiln of 1903 was a combination of those shown in Figs. 9 and 10

kilns shown in Figs. 12, 13 and 14 on this page.

Designers at length realized the advantages of forced draft and of ventilation and

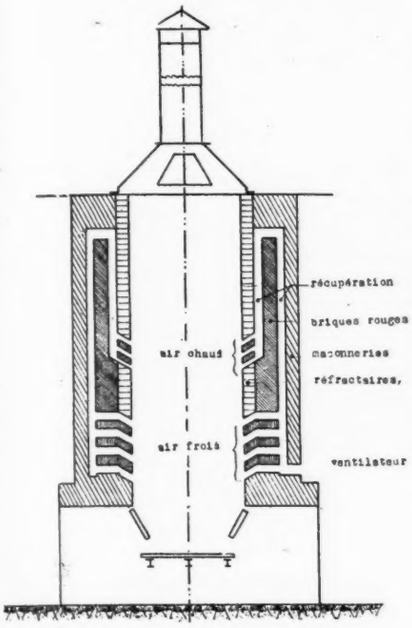


Fig. 12. One of the kilns which was designed from metallurgical practice for recovering heat

of coupling the two methods of aspiration and ventilation. In 1916 the writer, at the request of the minister of war, introduced regulated forced draft which summed up the advantages of ventilation in lime burning (Fig. 15).

To sum up, modern kilns may be divided into three classes: (1) Those with the plunging stack and natural draft; (2) those with the plunging stack, natural draft and recovery of heat, and (3) those with plunging stack, forced draft and recovery of heat. Of the kilns with recovery of heat two divisions may be made: (1) Kilns admitting a fixed amount of air, and (2) kilns admitting regulated and variable amounts of air.

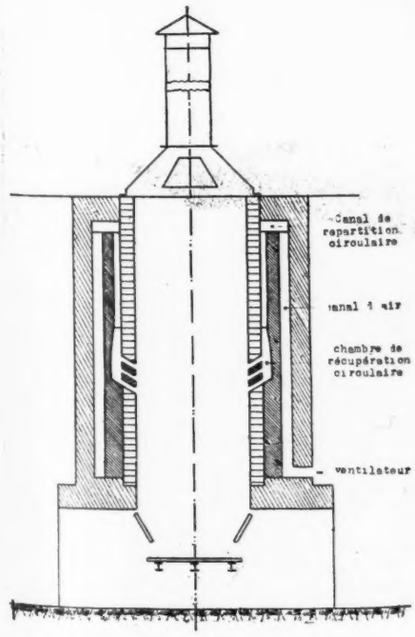


Fig. 13. A second form of kiln designed to recover heat

Improved Plastic Materials from Magnesia

A METHOD of producing hard plastics from magnesia by the use of ammonium chloride is described in a recent patent (U. S. 1,572,714). To the commercial magnesia containing as impurities small amounts of lime, etc., is added the hydrating water in which ammonium chloride has been dissolved. The amount of ammonium chloride is said to be about equal to the lime in the magnesia. The admixture is then either poured, tamped, pressed or cast into molds and placed into a steam chamber for 15 to 40 minutes. Other means of treating the mixture such as pressing in hot molds, etc., may be used. Different fillers may be added and also any desired coloring matter.

By the use of ammonium chloride, the inventor claims that he accelerates the setting and hardening reactions of the magnesia, the ammonium chloride acting as a catalyst.

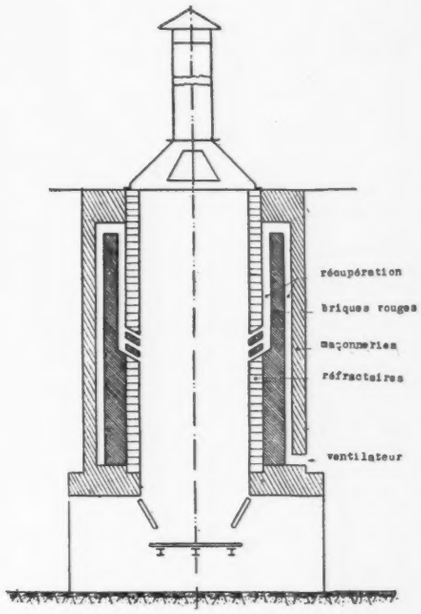
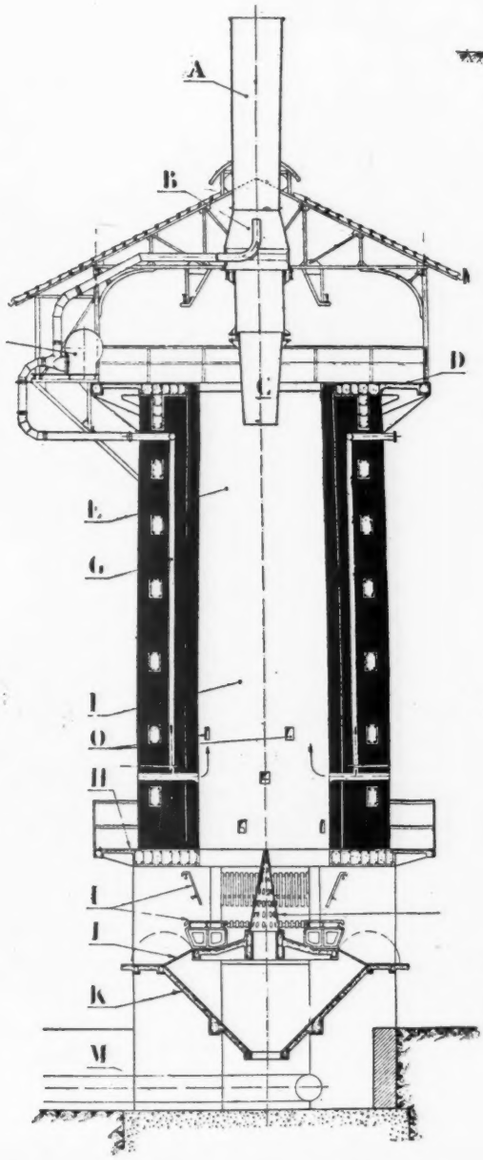


Fig. 14. A third form of heat-recovering kiln



LEGEND

A. Stack.
B. Induction pipe for removing gas for return.
C. Plunging cone which may be raised and lowered.
D. Charging platform.
E. Burning zone.
F. Cooling zone.
G. Air ducts for heat recovery.
H. Platform for draft regulatoin.
I. Discharging gratings.
J. Conical central grate.
K. Hopper for burned lime.
L. Doors for kiln discharge.
M. Conveyor for burned lime.
N. Exhaust fan.
O. Openings for admitting air to the kiln.

The cut below shows the variation for using cars instead of a conveyor.

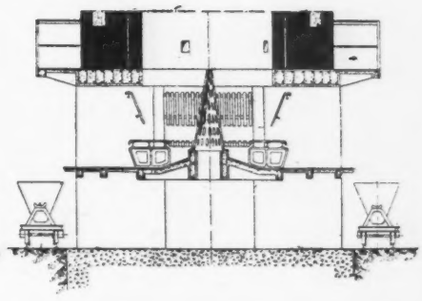


Fig. 15. The modern kiln (Systeme J. E. Duchez)

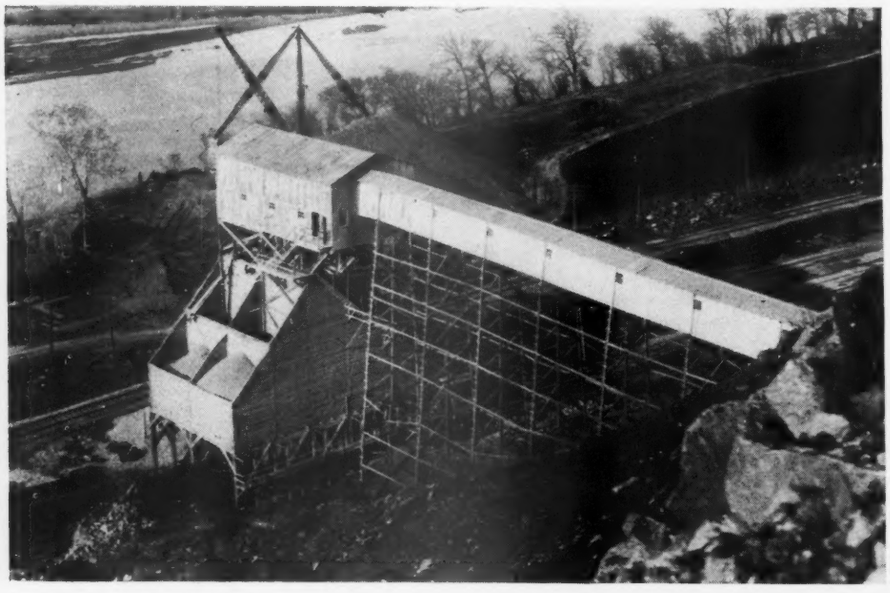
Hints and Helps for Superintendents

Method of Building a Crushed Stone Bin

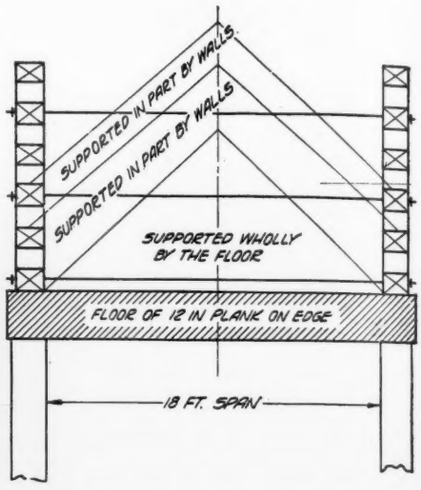
AT the plant of the Zenith Limestone Co., Tulsa, Okla., the bins are built in a peculiar way designed to economize on timber and labor by taking advantage of a principle used in the design of retaining walls.

If the walls were smooth the supporting action would not be so great. But these walls are built of 3x12-in. timbers laid flat and spaced 3 in. apart. This presents a surface on which the stone cannot slide.

When the bins were first erected it was generally predicted by those who saw them that the stone would all run out through the spaces between the timbers. A little stone did escape the first time the bins were filled but since that time there has been no loss from bin leakage.



Novel and economical crushed stone bins erected over railroad tracks



Illustrating the way in which the walls support the load

A feature of this bin that is worth considering is that it offers a free circulation of air and helps to dry out the stone if it contains any moisture. Bins somewhat similar to this have been built for the drying of wet phosphate rock. There is such a bin at the plant of the Hoover and Mason Phos-

The bins are built over railroad tracks. There are two of them and the span of each is 18 ft. The floor is of 2x12-in. planks placed on edge and nailed together. The height of the bin is such that if a volume of water equivalent in weight to the weight of crushed stone carried in the bin were to be supported by the floor, the floor would give way. But the design of the bin is such that the floor supports only part of the weight in the bin while the remainder of the weight is supported by the walls.

The way in which the walls support the bin is shown by the accompanying sketch. The triangular section which has the floor for a base has its sides at the angle of repose for this stone, or perhaps more properly in this connection at the sliding angle of the stone. This triangular section is supported by the floor without any assistance from the walls. The stone above may be considered as dividing itself into a series of arched or saddle-shaped layers, the ends of which rest on the side of the bin. The weight is therefore transmitted to the sides. The sides are prevented from spreading under this weight by rods which draw them together.

Spaced timbers in the bin construction allow economy of timber and provide free circulation of air

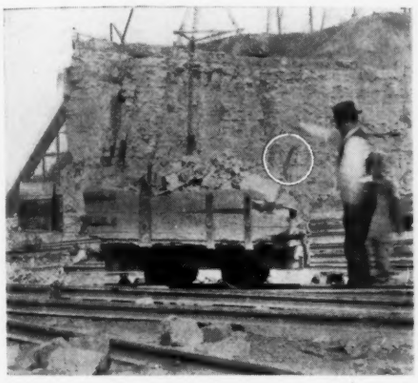
phate Co., located at Mount Pleasant, Tenn.

But it must be borne in mind that this type of bin is really suitable for crushed stone only and not for sand and gravel. Wet sand acts like a fluid and the bin is not designed to withstand fluid pressure. Even gravel, if it is made up of well-rounded pebbles, acts somewhat like a fluid.

Self-Releasing Chain Hook for Dumping Skips

AT THE QUARRY of the East St. Louis Stone Co., near East St. Louis, Ill., the quarry cars used are 4-wheel trucks with removable skip bodies. A pivoted derrick lifts the skips off the trucks and dumps them into an initial gyratory crusher.

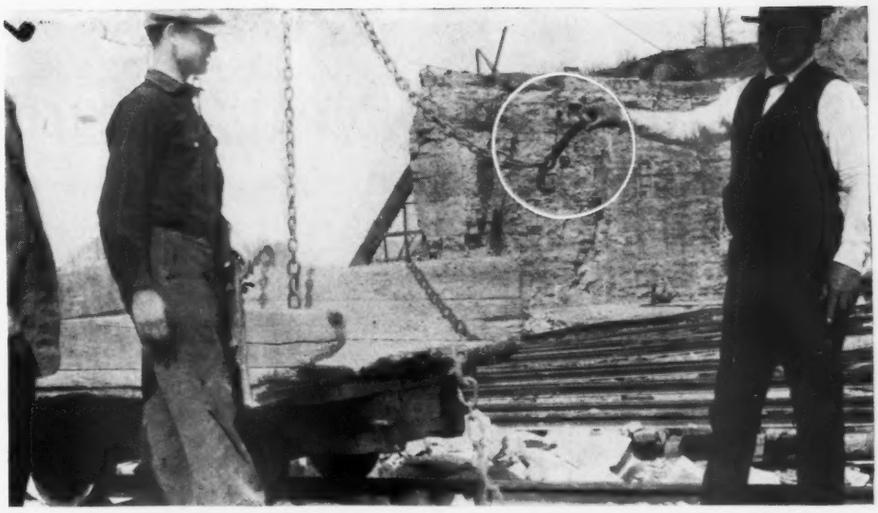
A special device was worked out and made by the plant blacksmith which makes it unnecessary for a laborer to reach out and



The hook is fastened so as to clear the stone

release the chain hook to dump the skip at the crusher. The hook is very simple, as the view shows, but it must be properly balanced, so that the moment the load is taken off the chain the counter weight will fall and release the hook from the chain link in which it is engaged when the chain is taut. It will be noted that the hook is engaged with the chain high enough to clear the stone loaded in the skip.

The hook is made wider than the link in which it is swiveled (the link is actually pinched together) so that there is no chance for the hook to spin around through the link and crush the fingers of the man who places it in position to lift the skip.



Self-releasing chain hook for use on skips

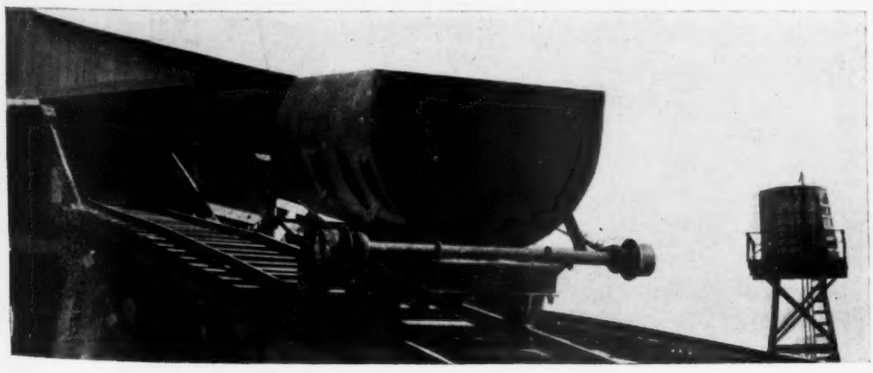
Car Made from an Old Boiler

THE particular car shown in the picture was not made from an old boiler, but it is a copy of one that was, and wherever old boilers are available in the section in which it is used, they are made into such cars. The pattern is almost standard in the limestone plants around Ocala and Brooksville, Fla. It has been much used in the phosphate rock fields as well.

The car is of the end dump variety and the rear is shown. The front end is not closed and the body is cut back at an angle so that the body is longer on the bottom than at the top. The boiler body is fastened to a frame which rests on the car trucks, but is pivoted at the front end so that by lifting the frame and body the contents will be poured out of the front end.

The lifting of the body is accomplished by an axle fastened to the frame which has a small wheel at either end. This shows clearly in the picture. At the end of the run these strike inclined tracks set at about 45 deg. and as they roll up on these tracks the rear of the body is carried with them. The inclined tracks (they look like braces) may be seen where the track enters the plant.

A rope is fastened at each end of the axle and brought forward to a bar in front of the body. The pulling rope from the hoist is fastened to the center of this bar.



Cars similar to this one may easily be made from old boilers

Turning the Flow from a Sand Cone

AT one of the plants of the Stewart Sand Co., near Kansas City, sand is loaded into cars directly from the cones which wash and dewater the discharge from the dredge. When no cars are available the discharge of the sand cones is turned into a stockpile.

Device turns off sand cone into stockpile

The method of changing the flow from the cars to the stockpile and back again is very simple. The discharge falls into a box made of steel plate. Two short spouts are fixed to the ends of this box and these discharge into troughs that lead, one to the car that is to be loaded, and the other to the stockpile.

The box has bars riveted on the side and on the lower end of each bar is a cylindrical piece that goes into a bearing. One of these shows in the picture. These bearings allow the box to be tilted. When one end is down the sand flows to the car and when the other end is down it flows to the stockpile.

A long arm from the upper part of one of these bars allows the box to be tilted easily and at a distance from the box. The change is quickly made without stopping the flow of the sand. It is used while cars are being changed, preventing any spill of sand on the track.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

(These are the most recent quotations available at this printing. Revisions, corrections and supplemental information will be welcomed by the editor.)

Stock	Date	Par	Price bid	Price asked	Dividend rate
Alpha Portland Cement Co. (common)[2]	May 25	100	120	123	1½% quar. Apr. 3
Alpha Portland Cement Co. (preferred)[2]	May 25	100	115	.....	1¾% quar. Mar. 1
Arundel Corporation (sand and gravel—new stock)	May 26	No par	32	32⅛	30c quar., Apr. 1
Atlas Portland Cement Co. (common)[2]	May 25	No par	46	49	50c quar. Mar. 1
Atlas Portland Cement Co. (preferred)	.....	100	.....	.....	2% quar. Oct. 1
Atlas Portland Cement Co. (preferred)[2]	May 25	33⅓	44	47	2% quar. Apr. 1
Bessemer Limestone and Cement Co. (common)[4]	May 22	100	135	142	1½% quar. Jan. 1, 4% ex. Jan. 1
Bessemer Limestone and Cement Co. (preferred)[4]	May 22	100	106	108	1¾% quar. Jan. 1
Bessemer Limestone and Cement Co. (convertible 8% notes)[4]	May 22	.....	115	125	8% annual
Boston Sand and Gravel Co. (common)[16]	May 21	100	70	80	2% quar. July 1
Boston Sand and Gravel Co. (preferred)[10]	Apr. 8	.....	.....	75	1¾% quar. Oct. 1
Boston Sand and Gravel Co. (1st preferred)[10]	Apr. 8	.....	.....	85	2% quar. Oct. 1
Canada Cement Co., Ltd. (common)	May 26	100	100	.....	1½% quar. Apr. 16
Canada Cement Co., Ltd. (preferred)[11]	May 21	100	113¼	113¾	1¾% quar. May 15
Canada Cement Co., Ltd. (1st 6's, 1929)[11]	May 21	.....	102	103	3% semi-annual A&O
Canada Crushed Stone Corp., Ltd. (6½s, 1944)[11]	May 21	100	93	96	
Charles Warner Co. (lime, crushed stone, sand and gravel)	May 24	No par	23	24	50c quar. Apr. 12
Charles Warner Co. (preferred)	May 24	100	100	103	1¾% quar. Apr. 22
Charles Warner Co. (lime, crushed stone, sand and gravel) 7s, 1929[16]	May 21	100	103	105	
Cleveland Stone Co.	May 27	.....	164	165	1½% quar., June 1, 1% ex. June 1
Connecticut Quarries Co. (1st Mortgage 7% bonds)[17]	May 21	100	104	.....	
Consolidated Cement Corp. (1st Mort., 6½s, series A)[24]	May 27	.....	96½	98½	
Consolidated Cement Corp. (5 yr. 6½% gold notes)[24]	May 27	100	99	100	
Consumers Rock and Gravel Co. (1st Mort. 7s)[18]	May 21	100	99	101	
Dexter Portland Cement Co. (6% serial bonds, 1935)[23]	May 21	.....	99¼	101	
Dolese and Shepard Co. (crushed stone)[7]	May 27	50	87	90	$1.50 quar. July 1, $1 ex. July 1
Egyptian Portland Cement Co. (7% pfd. with com. stock purchase warrants)[21]	May 24	99	101	.....	
Egyptian Portland Cement Co. (common)[21]	May 24	18	20	.....	
Giant Portland Cement Co. (common)[2]	May 25	50	32	37	
Giant Portland Cement Co. (preferred)[25]	May 25	50	45	46½	3½%s.-a. Dec. 15, plus 10% arrears
Ideal Cement Co. (common)	May 26	No par	71	75	$1 quar. Jan. 2. 50c ex. Dec. 27
Ideal Cement Co. (preferred)[6]	May 22	100	107	109	1¾% quar. Jan. 2
International Cement Corporation (common)	May 26	No par	53⅝	55½	$1 quar. June 30
International Cement Corporation (preferred)[2]	May 26	100	103½	103½	1¾% quar. June 30
International Portland Cement Co., Ltd. (preferred)	Mar. 1	.....	30	45	
Kelley Island Lime and Transport Co.	May 27	100	120	121	$2 quar. Apr. 1
Lawrence Portland Cement Co.[2]	May 25	100	100	110	2% quar.
Lehigh Portland Cement Co.[6]	May 22	50	86	88	1½% quar.
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, expire serially up to 1930)[13]	May 21	100	99	100	
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, expire serially from 1930 to 1935)[13]	May 21	100	97	99	
Michigan Limestone and Chemical Co. (common)[6]	May 22	.....	24	26	
Michigan Limestone and Chemical Co. (preferred)[6]	May 22	.....	23½	24½	1¾% quar. Apr. 15
Missouri Portland Cement Co.	May 26	25	55	55¾	25c quar. May 31, 25c ex. May 31
Monolith Portland Cement Co. (common)[9]	May 20	.....	11	11½	
Monolith Portland Cement Co. (units)[9]	May 20	.....	27	28	
Monolith Portland Cement Co. (preferred)[9]	May 20	.....	8	8½	
Nazareth Cement Co.[26]	May 24	No par	37	39	75c quar. Apr. 1
Newaygo Portland Cement Co.[1]	May 21	.....	120	.....	
New England Lime Co. (Series A, preferred)[14]	Jan. 29	100	96½	99	
New England Lime Co. (Series B, preferred)[22]	May 21	100	92	95	
New England Lime Co. (V.T.C.)[22]	May 21	.....	34	38	
New England Lime Co. (6s, 1935)[14]	May 21	100	99	100	
North American Cement Corp. 6½s 1940 (with warrants)	May 26	.....	97⅝	98	
North American Cement Corp. (units of 1 sh. pfd. plus ½ sh. common)[19]	Apr. 8	.....	94	99	2 mo. period at rate of 7%
North American Cement Corp. (preferred)	Dec. 31	.....	.....	.....	1.75 quar. May 1
Pacific Portland Cement Co., Consolidated[5]	May 21	100	91	91½	½% mo.
Pacific Portland Cement Co., Consolidated (secured serial gold notes)[5]	May 21	.....	99¼	100½	3% semi-annual Oct. 15
Peerless Portland Cement Co.[1]	May 21	10	5⅞	6¼	
Petoskey Portland Cement Co.[1]	May 21	10	9¼	9¾	1½% quar.
Rockland and Rockport Lime Corp. (1st preferred)[10]	May 25	100	98	98	3½% semi-annual Feb. 1
Rockland and Rockport Lime Corp. (2nd preferred)[10]	Apr. 8	100	.....	70	3% semi-annual Feb. 1
Rockland and Rockport Lime Corp. (common)[10]	Apr. 8	No par	.....	50	1½% quar. Nov. 2
Sandusky Cement Co. (common)[1]	May 27	100	106	135	$2 quar. Apr. 1
Santa Cruz Portland Cement Co. (bonds)[3]	May 21	.....	105½	106	6% annual
Santa Cruz Portland Cement Co. (common)[3]	May 21	50	82½	85	$1 quar. $1 ex. Dec. 24
Superior Portland Cement, Inc. (new stock)[20]	May 7	.....	.....	43½	
United Fuel and Supply Co. (sand and gravel) 1st Mort. 6s[27]	May 20	100	99¾	100	
United Fuel and Supply Co. (sand and gravel) 6% gold notes[27]	May 20	100	98¾	99	
United States Gypsum Co. (common)	May 26	20	134	134	2% quar., $1 ex. May 31
United States Gypsum Co. (preferred)	May 26	100	113	115	1¾% quar. June 30
Universal Gypsum Co. (common)[3]	May 27	No par	16	16¼	
Universal Gypsum V.T.C.[3]	May 27	No par	16	16½	
Universal Gypsum Co. (preferred)[3]	Aug. 5	.....	76	.....	1¾% quar. Sept. 15
Universal Gypsum Co. (1st Mortgage 7% bonds)[3]	May 27	.....	99	(at 6¼%)	
Union Rock Co. (7% serial gold bonds)[18]	May 21	100	98	100	
Wabash Portland Cement Co.[1]	Aug. 3	50	60	100	
Wisconsin Lime and Cement Co. (1st Mort. 6s, 1940)[15]	May 24	100	98½	100	
Wolverine Portland Cement Co.	May 26	10	6	6½	2% quar. Aug. 15

[1]Quotations by Watling, Lerchen & Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by True, Webber & Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by De Fremery & Co., San Francisco, Calif. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee, Higginson & Co., Boston, Mass. [11]Nesbitt, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson Jr. Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hemphill, Noyes & Co., New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]William C. Simons, Inc., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25] A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York.

QUOTATIONS ON INACTIVE ROCK PRODUCTS CORPORATION SECURITIES ON PAGE 74

Editorial Comment

Portland Cement Specifications

It appears probable that a change may be made in the national standard specifications for portland cement, in that the seven day tensile mortar strength requirement may be raised from 200 to 225 lb. The highway departments of New Jersey and Missouri have already made this change and it has been intimated that other highway departments and large purchasers of cement were ready to make it. This being so, it would seem far better for such a change to be nationally adopted, avoiding the confusion that would follow the adoption of varying standards by different purchasing agencies.

This was really the stand taken by three of the large cement producing companies who refused to bid under the changed Missouri specifications. They believe that any revision should come from nationally recognized organizations, and that the entire structure of standardization would be upset, and the cement industry seriously harmed, if they agreed to any other specification than that nationally adopted. They held to this in spite of the fact that the cement which they could furnish was considerably better than was demanded by the advanced specifications. This position seems to be the logical one to take. The whole structure of concrete engineering has been built up on the assumption that *all* portland cement meets certain standards, everywhere understood and accepted. To make local changes and to start an argument over the merit of various brands would lessen confidence in all portland cement as a building material.

But, at bottom, it is the cement manufacturers of the country who are responsible for the demand for higher specification requirements. By improving methods of grinding, mixing and burning, by the better selection of raw materials and, above all, by better control of the making of cement, they have greatly improved its quality. While the specifications stood still, the quality of the cement advanced until the *average* of all cements made was far in advance of what the specifications demanded.

Knowing how easy it is to obtain better cement, highway engineers and others naturally asked why they should design highway slabs and column sections overstrong, and why they should give long curing periods (especially to concrete highways which the public is anxious to have opened), only to benefit the isolated plant which made a cement that would just pass specifications and no more. It was inevitable that they should ask this question and having asked it that they should try to answer it for themselves by raising the specification requirements for the work under their control. This is the explanation for the action taken in New Jersey and Missouri, and it is certainly better to have the increased tensile strength requirement nationally adopted than to have other independent organizations follow their example.

As to the proposal of Thadeus Merriman to introduce a new cement specification based on the lime-silica index, told elsewhere in this issue, Mr. Merriman's figures bear out his proposal and it might be possible to draw a specification which would cover the thoroughness with which the manufacturing process had been applied. But with research of the constitution of portland cement in the stage that it is today, such a specification could not be adopted without much opposition from those who disagreed with his theory.

Building Wages Stabilizing

The Chicago bricklayers have signed up for a continuance of the present wage of $1.50 per hour and the Cleveland laborer's strike has been brought to an end by the acceptance of a wage which the laborers refused when they went out. According to the Chicago papers this means that some $200,000,000 worth of construction that was held up will now go on. And in Cleveland it is said that $80,000,000 worth which has been at a standstill since March 1 will now be pushed to completion.

This is gratifying because it insures the continuance of the present rate of building. It has been generally understood that banks would refuse to lend money for building if the cost was increased. Building materials have been slowly but steadily falling in price since 1923 while wages in the building trades have been rising slightly but with equal steadiness. Actually the rise in wages was compensated by the fall in materials to such an extent that the actual cost of construction has remained about at a level or was slightly lowered. But a point has been reached at which any serious increase in wages would affect construction costs so that it would be difficult to raise money for new work.

Charts without number have been published showing the advancing spread between wages and building material prices. It would be interesting to see a chart in which labor costs and material costs were compared. Present-day economists see no objection to high wages provided that they are followed by high production. In fact they approve of them and they point out that the prosperity that America enjoys today is based on high wages paid for a high rate of production. But a break in the cycle of wages and production will come and the prosperity of the country will collapse whenever a particular division of labor succeeds in taking out a greater share in the product than its part in the production justifies.

QUOTATIONS OF INACTIVE ROCK PRODUCTS SECURITIES

Stock	Date	Par	Price bid	Price asked	Divided rate
Coplay Cement Mfg. Co. (common) (4)	Dec. 16	.....	12½	.....	
Coplay Cement Mfg. Co. (preferred) (4)	Dec. 30	.....	70	.....	
Eastern Brick Corp. 7% cu. pfd.) (1)	Dec. 9	10	40c	.....	
Eastern Brick Corp. (sand lime brick) (common) (1)	Dec. 9	10	40c	.....	
Edison Portland Cement Co. (common)	Nov. 3	50	7½c(x)	.....	
Iroquois Sand & Gravel Co., Ltd. (2 sh. com. and 3 sh. pfd.) (1)	Mar. 17	.....	$12 for the lot	.....	
Edison Portland Cement Co. (preferred)	Nov. 3	50	17½c(x)	.....	
Lime and Stone Products Co. (1100 sh. pfd., $10 par and 700 sh. com., $10 par)	Feb. 10	.....	$66 for the lot	.....	
Missouri Portland Cement Co. (serial bonds)	Dec. 31	.....	104¾	104¾	3¼ % semi-annual
Olympic Portland Cement Co. (g)	Oct. 13	.....	.....	£1⅝	
Phosphate Mining Co. (1)	Nov. 25	.....	1@5	.....	
Pittsfield Lime and Stone Co. (preferred)	.....	100	.....	.....	2% quar. Apr. 1
Rock Plaster Corp. (390 sh. com., no par) (1)	Mar. 17	.....	$12 for the lot	.....	
Simbroco Stone Co. (pfd.)	Dec. 12	.....	.....	.....	$2 Jan. 1
Tidewater Portland Cement Co. (common) (3)	Nov. 25	.....	8½	.....	
Vermont Milling Products Co. (slate granules) 5 sh. pfd. and 1 sh. com. (2)	Dec. 30	.....	$1 for the lot	.....	
Winchester Brick Co. (preferred) (sand lime brick) (5)	Dec. 16	.....	10c	.....	

(g) Neidecker and Co., Ltd., London, England. (1) Price obtained at auction by Adrian H. Muller & Sons, New York. (2) Price obtained at auction by R. L. Day and Co., Boston. (3) Price obtained at auction by Weilepp-Bruton and Co., Baltimore, Md. (4) Price obtained at auction by Barnes and Lofland, Philadelphia, Pa. (5) Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. (x) Price obtained at auction by Barnes and Lofland, Philadelphia, on November 3, 1925.

Marquette Cement Bonds Offered

HITCHCOCK AND CO., Chicago, Ill., are offering at prices to yield from 5 to 6%, according to maturity, $3,000,000 first mortgage 6% serial gold bonds of the Marquette Cement Manufacturing Co., Chicago, Ill., dated April 1, 1926, due serially each year up to October 1, 1945.

Information concerning this issue is given in the accompanying letter of T. G. Dickinson, president of the company, from which we summarize as follows:

Description of Bonds.—The bonds are dated April 1, 1926, and mature serially in annual installments of $150,000 from October 1, 1926, to October 1, 1945, with interest at 6% per annum payable April and October 1. They are issued in denominations of $500 and $1000 in coupon form, registerable as to principal, and are redeemable at the option of the company at 102 and interest on any interest date on 30 days' previous notice. The total amount authorized is $5,000,000, of which $3,000,000 are now outstanding. Additional bonds up to the total authorized amount may be issued to cover the cost of new plants or betterments to existing ones to the extent of 66⅔% of such expenditure.

Security.—These bonds are secured by a first mortgage on all of the properties now owned by the company, consisting of two complete cement manufacturing plants, located at La Salle, Ill., and Cape Girardeau, Mo., together with warehouses, etc.

The company generates its own power and operates its boilers entirely on waste heat from the kilns. Ample rail and water shipping facilities are available for movement of the company's product.

Assets and Earnings.—Attached hereto is statement of the financial condition of the company as of December 31, 1925, certified to by Messrs. Howard Kroehl and Co., certified public accountants, Chicago, which, after giving effect to the issuance of these bonds, shows net tangible assets of $11,634,527.79 or $3,878 for each $1,000 bond.

The auditor's statement also shows average net earnings of the company applicable to interest charges for the last five years to have been over five times the maximum interest requirements of this issue, and for the past three years to have been over seven times such charges.

Provisions.—The trust deed provides that the company shall pay no dividends on its capital stock which will reduce the net current assets below 50% of the outstanding bonds.

Purpose of Issue.—These bonds have been issued to reimburse the treasury of the company for improvements and additions to its plants.

Management.—The business has been under capable and successful management for the past 24 years, which will continue unchanged. During this period it has grown from an annual capacity of 250,000 bbl. to its present capacity of 4,500,000 bbl.

CONDENSED BALANCE SHEET AS OF DECEMER 31, 1925

(After giving effect to the issuance of $3,000,000 First Mortgage 6% Serial Gold Bonds dated April 1, 1926)

Assets

Current Assets:	
Cash	$ 1,249,427.58
Cash surrender value of life insurance	45,704.60
Notes and accounts receivable	352,290.62
Less: Reserve	18,163.05
Inventory	1,168,779.15
Total current assets	$ 2,798,038.90
Investments	47,633.41
Fixed Assets:	
Plant and property	10,961,497.41
Deferred charges to operations	22,721.55
Total assets	$13,829,891.27

Capital and Liabilities

Current Liabilities:	
Accounts payable	$ 353,694.87
Wages	46,077.27
General and federal income taxes	226,204.66
Interest and expense items	46,553.73
Total current liabilities	$ 672,530.53
Funded Indebtedness:	
First mortgage 6% serial gold bonds authorized $5,000,000 to be issued	3,000,000.00
Reserves:	
Depreciation and depletion	1,441,377.39
Liability insurance	58,734.01
Capital Stock:	
Preferred—6%	4,738,700.00
Common	780.500.00
Surplus	3,138,049.34
Total capital and liabilities	$13,829,891.27

North American Cement Preferred Offered

HEMPHILL, NOYES AND CO., Eastman, Dillon & Co. and R. F. De Voe and Co., Inc., are offering $850,000 7% cumulative preferred (a. and d.) stock at 99 per share. Each two shares of preferred stock will carry a bonus of one share of common stock.

Company—Incorporated in Delaware in August, 1925, for purpose of owning and operating plants engaged in manufacture of portland cement and kindred commodities. As of September 1, 1925, acquired the business and properties of the Security Cement and Lime Co. and Helderberg Cement Co., including their three successful plants located at Hagerstown, Md., Berkeley, W. Va., and Howes Cave, N. Y. Through present financing it will acquire the business and properties of the Acme Cement Corp., located near Catskill, N. Y. The combined productive capacity of the plants now owned and the one presently to be acquired is stated to be equivalent to 3,700,000 bbl. of cement per annum, which, upon completion of the improvements now in progress (estimated to be completed about July 1, 1926), is expected to be increased to more than 4,500,000 bbl. per annum.

The plant of the Acme Cement Corp. has present productive capacity of 1,000,000 bbl. of cement per annum. Improvements now in progress and estimated to be completed about July 1, 1926, are expected to increase the capacity to 1,500,000 bbl. per annum.

Earnings—Combined net income, after depreciation on the present annual basis, of the properties now owned and to be acquired upon completion of transactions incident to the present financing, for the year ended Dec. 31, 1925, and after deducting annual interest requirements of the funded debt presently to be outstanding and Federal taxes computed at the present rate, was $910,207, equivalent to over 2½ times the annual dividend requirements of the preferred stock presently to be outstanding. Notwithstanding the fact that the company will not receive in 1926 the full benefit of the expenditure of approximately $1,750,000 for the improvements estimated to be completed about July 1 of this year, it is estimated that, based on present conditions in the cement industry, such earnings for 1926 applicable to the preferred stock will be substantially increased.

Assets—Balance sheet of Dec. 31, 1925, with adjustments to give effect to the proceeds of the present financing, shows current assets of over 4.20 times current liabilities, and total net assets of over $7,472,689 applicable to the preferred stock. equivalent to over $145 a share of such stock presently to be outstanding.

Purpose—Proceeds will be used to pay for the fixed assets of Acme Cement Corp., and to provide funds for betterments, additional working capital and other corporate purposes.

Capitalization—

	Authorized	Outstanding
First mortgage 6% bonds, due 1935 (Acme)	(Closed)	$300,000
Sinking fund gold debentures	$15,000,000	7,607,500
7% cumulative preferred stock (par $100)	10,000,000	5,150,000
Common stock (no par value)	350,000 shs.	133,250 shs.

—*Financial Chronicle.*

Dividends Declared

Company	Rate	Date Pay'ble
Cleveland Stone Co.	1½% qu.	June 1
Cleveland Stone Co.	1% ex.	June 1
Dolese & Shepard Co.	$1.50 qu.	July 1
Dolese & Shepard Co.	$1.00 ex.	July 1
Int. Cement Corp. (com.)	$1.00 qu.	June 30
Int. Cement Corp. (pfd.)	1¾% qu.	June 30
Mo. Port. Cement Co.	25c qu.	May 31
Mo. Port. Cement Co.	25c ex.	May 31
U. S. Gypsum Co. (com.)	2% qu.	June 30
U. S. Gypsum Co. (com.)	$1.00 ex.	May 31
U. S. Gypsum Co. (pfd.)	1¾%	June 30

Monolith Cement Co.'s plant at Monolith, Calif. A third stack has been erected since the picture was taken

Monolith Portland Prepares Large Blast

A CHARGE of 112,000 lb. of dynamite will be set off at the quarry of the Monolith Portland Cement Co. at Monolith, Calif. The public has been invited to view the large blast which is expected to dislodge about 250,000 tons of rock.

The blast will be set off simultaneously in 21 dynamite pockets. A 430-ft. tunnel has been driven into the side of the mountain to prepare for it. Two igniting systems will be used to make certain that each of the twenty-one dynamite loads is discharged.—*Los Angeles (Calif.) Times.*

Trinity Portland Takes Option on Plant Site at Houston

THE Trinity Portland Cement Co., Dallas, Texas, has obtained an option to purchase a tract of 17 acres of land situated on the ship channel at Houston, Texas, from the Texas Co. for use as a site for a cement plant. It is stated that if the transaction is completed the company will contsruct a cement mill at a cost of approximately $1,500,000. It already owns and operates cement plants at Dallas and Forth Worth. A description of the new plant at Fort Worth was published in Rock Products, November 28, 1925, issue.

Imports of Foreign Cement into North Atlantic Seaports Increase

EUROPEAN-MADE cement, which is rapidly becoming one of the more important items of importation at Boston, finds a ready market at several North Atlantic seaports.

During the building boom of the past few years the imports began to increase and thousands of tons are now being brought in every year. The latest lot to arrive is on the steamer *Schodack,* from Dunkirk, Belgium, and Havre, France. This vessel has 4400 tons of freight, most of which is cement.

In 1924 the importation of cement at Boston amounted to 9769 tons, of which 9311 tons was free of duty, coming mostly from Belgium and the balance was dutiable, coming largely from Norway. In 1925, imports amounted to 53,925 tons, of which 28,635 was duty free and 25,290 tons dutiable. During the first three months of 1926, imports aggregated 11,432 tons, of which 9828 was duty free and 1604 dutiable.

Quotations of American cement, laid down at Boston, are given as $2.93 per bbl. less a discount for cash and returnable bags. About the price of foreign cement, little information can be secured but it is understood that at least 20 cents lower is quoted and some quotations are heard as low as $2.40. —*Christian Science Monitor.*

Atlas Portland Directors Elected

AT the annual stockholders' meeting of the Atlas Portland Cement Co., held recently at the general offices of the company, Northampton, Penn., the following directors were elected for the ensuing year: George F. Baker, Jr., George G. Bourne, Lowell R. Burch, Edward F. Carry, A. G. Croll, Henry Graves, Jr., Howard W. Maxwell, J. R. Maxwell, W. E. Miner, John R. Morron, Alfonso de Navarro and L. H. Repass.

North American Cement Uses Unique Accident Recorder at One of Its Plants

A NOVEL means of recording progress in accident prevention has been used by the Berkeley, W. Va., plant of the North American Cement Corp. As shown in the illustration, a score board has been constructed in the form of a race track with each day of each month marked. A miniature automobile travels along the track, each department being represented in the car by a dummy. All departments start the ride at the beginning of the year and continue to do so until an accident occurs, when the dummy representing the unfortunate department must get out and walk the remainder of the distance. A full ride around the board means no accidents.

Similar devices used during the past four years have helped to maintain the interest and enthusiasm which has brought about a steady reduction in accidents. In 1922 there were 42 accidents with 643 days lost; in 1923, the score was 21 accidents and 449 days; 1924, 7 accidents and 77 days, while in 1925 there were only 5 accidents with 65 days lost. —*National Safety News, Chicago, Ill.*

North American Cement Corp.'s novel accident recorder shows each day which departments are operating without accidents

New York Crushed Stone Producers Hold First Meeting of the Year

THIRTEEN members of the New York State Crushed Stone Association were present at Syracuse on the morning of April 13 when President Seitz called the meeting to order. The minutes do not show that anything was said about the number being unlucky, but the president gave a brief talk on the necessity of securing a better attendance and an increased membership for 1926.

James Savage made a brief review of the financial situation of the National Crushed Stone Association and the collection of the amount pledged by the state association for national work.

The matter of an emblem was discussed and it was left for the chair to look up a suitable emblem to be used by individual producers.

Perhaps the most important action of the meeting from the viewpoint of the whole industry was the discussion of the table of standard sizes proposed in the March 1 issue of the *Crushed Stone Journal*. A resolution was passed to the effect that the proposed table of standard sizes did not meet with the approval of the association. It was voted to appoint a committee to confer with National Research Director Goldbeck on an alternative table of standard sizes more in accord with the requirements of the members. Messrs. Seitz, Sporborg and Savage were appointed.

George Schaefer then spoke of the advisability of the association having prepared for educational purposes a three or four reel moving picture to show the production and uses of crushed stone from quarry to completed work.

He also spoke of the deterrent effect upon our industry of remarks made at various county highway meetings by a representative of the Barrett Co., in which he recommended gravel and slag to the exclusion of crushed stone in bituminous macadam construction. A committee of three members, Messrs. McNasser, Owens and Sporborg, was appointed to consult with the Syracuse office of the Barrett Co. to remedy the situation if possible.

After discussing various locations for the May meeting the matter was left to the president to decide.

Western Kentucky Coal Mine Operators Discuss Rock Dusting

ROCK dusting in coal mines as a preventive measure to escape serious damage to mines and equipment, and loss of life, from explosions, came in for serious discussion at a meeting of the West Kentucky Coal Bureau, composed of West Kentucky coal mine operators, meeting at the Seelbach hotel, Louisville, Ky., on May 11.

The West Kentucky Coal Co., a subsidiary of the North American Co., has recently treated some of its mines and plans to treat all of its properties. This is the largest producing company in the field, with more than twenty mines.

The Duvin Coal Co., near Madisonville, Ky., recently rock dusted its mine, and it is believed that this precautionary measure prevented serious damage to the property in a recent early morning explosion.

Western Kentucky mines over the past five years have had several explosions, in which from one to a dozen men have been killed, and considerable property damage done. Rock dusting has been proven of great value in northern and eastern mines, and much interest was shown in the discussions, and many questions asked. Most of the Western Kentucky operators are unacquainted with the general plan, except for such material as they have read regarding it in the coal trade journals, which have been giving considerable attention to the matter over the past two or three years.

Operators believe that by rock dusting they can reduce insurance rates, both liability and fire, save lives, and prevent mines from being tied up for long periods as a result of damage done by serious explosions, which generally follow small ones.

New Company to Produce Road Stone in Florida

THE Marianna Lime Products Co. has been recently incorporated at Marianna, Fla., to develop the limestone deposits near that city. A tract of land said to hold a good supply of rock is reported to have been acquired.

Plans call for the construction and installation of five crushing plants each of a capacity of 30 to 40 cars per day. A spur will be run from the plants to the L. & N. siding. Crushed road stone will be produced and it is expected will be used for roads in West Florida, Alabama, Georgia and Mississippi. According to the announcement, operations will begin within a few months.

The officers of the new company are: A. M. Lewis, president; D. P. Daniel, vice-president, and Carl A. Robinson, secretary-treasurer. The board of directors is said to be composed of business men of Marianna and Chicago.—*Talahassee (Fla.) Democrat.*

Progress of Rock Dusting

WHEN the American Association for Labor Legislation began to agitate for protection there were only three coal companies using rock dust. There are now more than 100. The Castle Gate explosion in Utah cost the company and the community more than $1,000,000, and yet for less than 1% of the value of the coal produced the catastrophe could have been avoided. The omission to provide rock dusting machinery should be regarded as an offense to be heavily penalized. In another year, if state legislatures rise to their duty, there should not be a mine in America where this simple and inexpensive safeguard is not in use.—*Editorial in New York Times.*

The Effect of Good Roads in North Carolina

WHILE it would be obviously foolish to attribute all the progress North Carolina has made since 1921 to good roads, yet it is a fact that up to that time this State had made little headway in any direction. Since 1921, however, there has been a different story to tell—not a story of boasting or even boosting, but of real advancement.

Nearly 5,500 miles of first class highways already built and 6,400 miles as its temporary goal. That's North Carolina today.

Between March, 1921, an July, 1925, the sum of $98,000,000 was expended for good roads in North Carolina, with a balance of $13,000,000 available making a total of $111,000,000. This included some federal aid. But the people themselves, through their representatives, have voted $85,000,000.

Money derived from gasoline sales and the registration of automobiles not only pays the interest on outstanding bonds but provides sufficient funds for maintaining roads already constructed. It also feeds a sinking fund which will be used to retire the bonds when they mature.

Improved highways have brought about better marketing conditions. During the 1925 season the State Department of Agriculture, at the head of which is William A. Graham, marketed for 15,000 farmers of this state more than a million pounds of live poultry, at a direct saving to the producers of between $50,000 and $100,000. Also the department marketed nearly 4,000,000 eggs at a saving of 5 cents on each dozen. This could never have been accomplished while the state was honeycombed with mud ruts called roads that were passable only a part of each year.

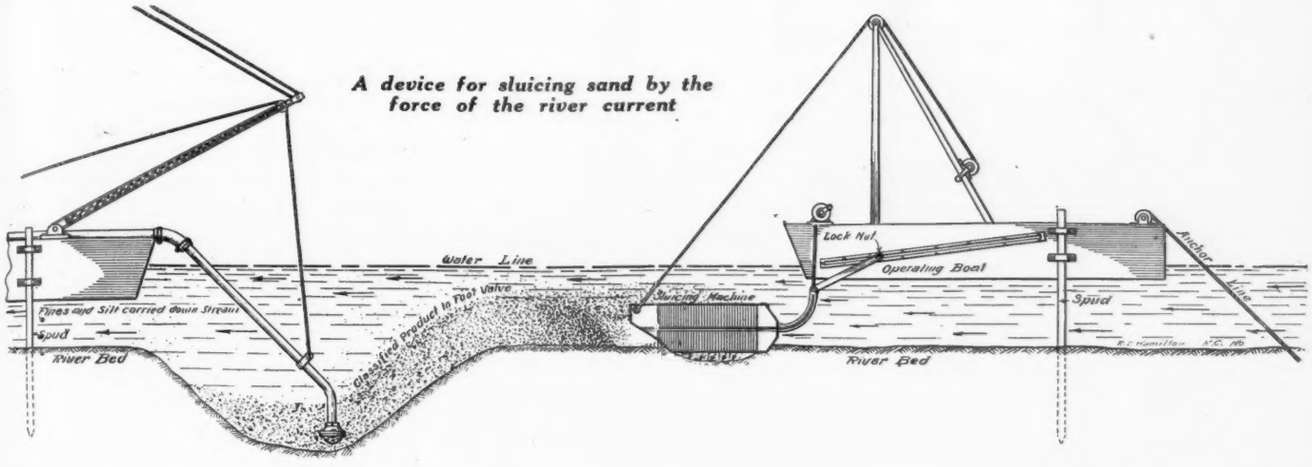
Shipments of fruit and truck have increased at a phenomenal rate. During the summer of 1925 farmers shipped out of North Carolina nearly 14,000 carloads of fruit and truck by fast freight. In addition, truckers in the Wilmington section alone shipped 168,000 packages by express. Another tribute to good roads.

During the time that $98,000,000 was spent in road building, approximately $200,000,000 was spent on public education and the value of public school property rose from $24,000,000 to $60,000,000. Included in this $200,000,000 was $20,000,000 spent on negro education alone.

The spirit of education in its broadest sense brought North Carolina to the point where it was willing to make huge investments in highway construction. In return the good roads movement has contributed to the cause of education.—*New York Sun.*

New Builders Exchange

THE Builders' Exchange of San Antonio, Tex., now has a new ten-story building of its own, including permanent exhibits of building materials, and all the other functions which go with a well-appointed exchange. It includes more than 300 firms.



A device for sluicing sand by the force of the river current

A New Device for Sluicing Sand and Gravel

THE Minerals Recovery Corporation of Kansas City, Mo., has recently brought out a device for sluicing sand and gravel in a river which may be used as an adjunct to a dredge. Originally it appears to have been designed for moving sand and gravel in the bed of a stream so as to open a channel or protect the bank of a river or harbor by moving material so as to throw the current away from the bank. But the company says it may be applied to sand and gravel production.

The machine operates by the force of the current of the river. It is a triangle, open at the base which is placed against the flow of the current. The current enters the base and strikes a series of deflector blades which turn its force to the bottom of the river. This breaks the current into a number of small eddies which lift the sand and gravel and throw it upwardly into the main current of the river, which carries it down stream. If the machine is placed in front of a dredge it will sluice the sand and gravel to the dredge suction as shown in the cut.

So far as actual sand and gravel production is concerned, the machine appears to be in the experimental stage. It is interesting because it proposes to use a force which has not been utilized before, that of the river current, to lift the sand and gravel from the river bed, thus to avoid the use of devices which take mechanical power to operate.

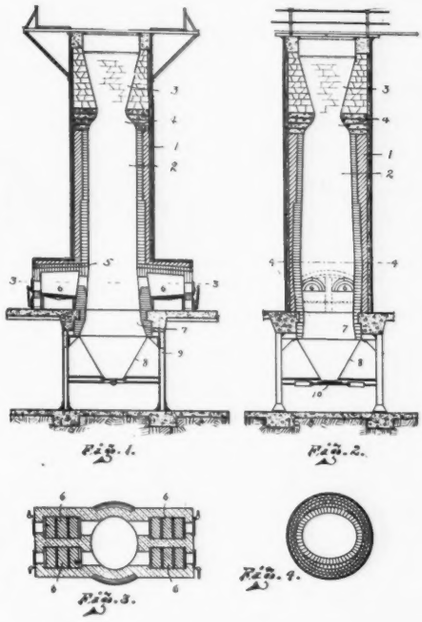
The inventors caim that the sand is not only lifted from the river bed but classified by the sluicing.

Correction

IN the announcement of the winners of the National Safety Contest, published in ROCK PRODUCTS, May 15 issue, it was stated that honorable mention was won by the underground limestone quarry of the Alpha Portland Cement Co. at Milltown, Ind. The award should have been credited to the Louisville Cement Co., who operate the quarry referred to.

Newly Patented Form of Lime Kiln

HUGH MISCAMPBELL of Duluth, Minn., the well-known manufacturer of lime machinery has patented a lime kiln (U. S. 1,572,156, Feb. 9, 1926) which claims advantages of simplicity of construction combined with practical and efficient operation. There is only a single claim and this reads: "A lime kiln comprising a vertically elongated chamber and a port in the lower portion thereof for injecting heating gas there-



into, said chamber comprising two opposed parallel vertical walls and two diametrically opposite walls diverging downwardly and on the same level as said vertical walls for the purpose described."

In the description given in the patent papers it is pointed out that this construction avoids any straight necked portion with consequent danger of clogging. The "choke," although it enlarges abruptly in the hopper, is formed of easy curved lines to avoid clogging at that point.

Phoenix Sand and Gravel Co. Not a Monopoly

THE manner in which the Phoenix Sand and Gravel Co., New Orleans, La., is operated is not in violation of any state laws and does not constitute a monopoly. This is the opinion expressed by Percy Saint, state attorney general, in a recent letter to Commissioner Klover and City Attorney Walmesy of New Orleans. Mr. Saint also declared that the company operates in conformity with business ethics.

It was said in city hall after the receipt of the letter that Mr. Saint's opinion automatically would end the agitation over the recent increase in the price of sand and gravel. City authorities instituted action when it was thought the increase would seriously affect paving prices, but this result did not materialize.

"I have concluded that the Phoenix company is not a monopoly, and that its transactions are not in restraint of trade," Mr. Saint wrote, "nor do I think it has the power of price-fixing that would render it an organization in restraint of trade.

"As I understand, from the investigation made by me, the Phoenix Sand and Gravel Co. is owned by several sand and gravel producers in and adjacent to the city of New Orleans. Each producer of sand and gravel maintains his own producing organization, but sells his entire output to the Phoenix Sand and Gravel Co. at a fixed price and that company re-sells the material to consumers and buyers.

"I am of the opinion that the Phoenix Sand and Gravel Co. makes more for efficiency in the selling and distributing of sand and gravel than it does in the direction of producing a monopoly."—*New Orleans (La.) States.*

The Phoenix company's policy and purpose was as outlined by the secretary in a letter to ROCK PRODUCTS published in the May 1st issue. When the formation of the company was first announced it was violently attacked by the New Orleans papers as a combination in restraint of trade. Later the opposition to the new company subsided.

Portland Cement Manufacturers Make Remarkable Safety Record

Accident Prevention a Feature of New York Meeting of Portland Cement Association

AT the Spring meeting of the Portland Cement Association in New York City, May 18, some remarkable figures were given to show the progress being made by members of the association in accident prevention. A. C. Tagge, of the Canada Cement Co., Ltd., Montreal, Que., chairman of the committee on accident prevention and insurance, reported that the reduction in lost time accidents on a man-hour basis of comparison had been reduced in 1925 by 23.5% over 1924—making the best record for any one year in the history of the industry.

Since 1920, when the accident prevention bureau of the association was placed under the supervision of H. G. Jacobsen, the percentage of reduction in lost time accidents on a man-hour basis of comparison has been 38.4%. In 1925 a better record was made in accident prevention by 47 plants than was made by the plant with the best record in 1920.

This steady progress in accident prevention is being taken account of by employers' liability insurance companies and rates are in many instances being readjusted to the up-to-date accident statistics of the cement industry. Self-insurance was carried by 37% of the plants (based on man-hours) in 1925, which is a gain over any previous year. In other words, where insurance companies have been reluctant or slow to readjust their rates, the member companies themselves have not been slow to take over the insurance of their employes and profit from the reduced hazard.

Among the other features of the meeting were papers on: "Electric Shovels in Cement Quarry Operations" by J. F. Magee, division engineer of the Alpha Portland Cement Co., Easton, Penn.; and "Development and Use of the Fuller-Kinyon Conveying System," by Alonzo G. Kinyon, manager, conveying department, Fuller-Lehigh Co., Fullerton, Penn.

At the banquet on May 19, G. S. Brown, president of the Alpha Portland Cement Co., Easton, Penn., was toastmaster. Hon. Hanford MacNider, assistant secretary of war, Washington, D. C., made an address on "Industrial Preparedness," and Francis H. Sisson, vice-president, Guaranty Trust Co., New York City, an address on "What's Ahead for Business." Mr. Sisson seemed inclined to believe that there was danger of overproduction in nearly all manufactured commodities and caution in marketing is essential, but he was sure that fundamental business conditions were sound, since there is still a very easy money market and no signs of let-up in the purchasing power or demand of the public. It would seem, merely, that many industries, including the cement industry, have reached a temporary saturation point on consumption, but that with sane administration on the part of producers the future will take care of itself.

H. G. Jacobsen

State Mineral Rights Opposed

A WIDESPREAD movement among western members of Congress, designed to turn over to the states the minerals found on public lands granted to them for school purposes, will not have the approval of the administration. In a letter sent to Chairman Stanfield of the Senate Lands Committee, Secretary Work urged that none of the more than a dozen pending bills for that purpose be enacted, at least until there has been a thorough study of the situation and more information obtained.

Minerals from Bolivia

THE total exports of minerals from Bolivia during 1925 amounted to 127,143,866 kilos, compared with 123,989,598 kilos in 1924 and 115,633,576 kilos in 1923.

Importance of Pea Gravel in Cement Products

THE economy which can be realized by the use of the smaller sizes of gravel in the manufacture of concrete building units is often overlooked. Information furnished by the Portland Cement Association brings out clearly the advantages to be gained by controlling the grading of the aggregate, says Stanton Walker in a Bulletin of the National Sand and Gravel Association.

Tests of 8x8x16 in. concrete block, in which the grading of the aggregate ranged from all sand to 30% sand and 70% gravel (gravel graded from about ⅛ in. to ½ in.) showed that a mixture of 45% sand and 55% gravel in a 1-7 mix, gave over 100% higher strength than the same mix using sand only as the aggregate. In these tests the fineness modulus of the sand was 2.63 and of the mixture of sand and gravel 4.50.

The necessary compressive strength of a concrete building unit is fairly well standardized by building code requirements as 700 lb. per sq. in. at 28 days, and the advantages of better graded aggregates can generally be utilized to produce more units for a given amount of cement. These tests show that the number of units of a given strength made from one sack of cement may vary from 15 to 25, depending upon the grading of the aggregate. The following table, compiled from the above mentioned report, shows the approximate number of units (8x8x16 in.) per sack of cement having compressive strengths of 700 lb. per sq. in. at 28 days, which were obtained for different gradings of aggregate:

Fineness modulus	Kind of aggregate represented	No. of units
2.50	Concrete sand of medium coarseness	15
3.00	Well graded concrete sand	16½
3.50	About 75% sand and 25% pea gravel	18½
4.00	About 60% sand and 40% pea gravel	21
4.50	About 50% sand and 50% pea gravel	25

The limit to which pea gravel can be added advantageously to ordinary sand in the manufacture of concrete building units is limited only by the workability of the mix.

Florida Phosphate Shipments Approach Post-War Levels

ONE of the greatest movements of phosphate through the Seaboard Air Line railway terminal at Seddon Island since the peak pre-war and war times is indicated for the month of May. Trans-shipment of more than 60,000 tons is scheduled.

Nine boats are due at Seddon Island to take on phosphate cargoes aggregating 33,950 tons.

Eight other vessels are scheduled to arrive near the end of the month for phosphate loading. It is expected their cargoes will bring the grand total for the month above 60,000 tons. This will be the largest tonnage passing through the island terminal since January, 1925, and one of the largest since pre-war days, when a movement of 70,000 tons a month occasionally was recorded.—*Tampa (Fla.) Tribune.*

Lime Industry in Readiness for National Convention

New Technical Developments Will Be Explained, and Business Matters Discussed

INTERVIEWS with lime manufacturers and reports coming to ROCK PRODUCTS office indicate a wide interest throughout the industry in the coming convention at French Lick, Ind., and a good attendance is assured.

French Lick is perhaps as nearly the center of the lime industry, if production figures are taken into consideration, as one could locate a suitable convention spot; and that this one is highly suitable is beyond question.

The program promises to be an instructive and profitable one, from both the technical and business angles. Charles Warner of Wilmington, Del., president of the National Lime Association, said recently that important new discoveries made in government and private laboratories concerning the uses of lime will be discussed at this meeting.

The program provides ample activities for the ladies and it is expected that the attractions of French Lick will bring out a goodly number of them.

So far as completed the program is as follows:

PROGRAM

Tuesday, June 8

Morning

10 a. m.—Directors' meeting (first session).

Afternoon

12:30 p. m.—Lunch.

1:30 p. m.—Executive meeting of full membership, appointment of committees, audit, resolutions, Maxet committee report; Central Division, W. H. Magee, manager.

8:30 p. m.—Round-table (manufacture).

10 p. m.—Bridge party.

Wednesday, June 9

Morning

10 a. m.—"The Market for Lime," Irving G. Fellner, business manager, McGraw Hill Publishing Co., New York City.

10:45 a. m.—"Economical and Substantial Construction," J. P. Mollenkof, superintendent of construction, John H. McClatchy Co., Philadelphia, Penn.

11:30 a. m.—Bates Multi-Wall Valve Bag (moving picture).

11:45 a. m.—"Balanced Publicity," R. P. Brown, manager publicity department, N. L. A. (discussed by J. M. Deely).

Afternoon

12:30 p. m.—Lunch.

1:30 p. m.—"Concrete, Asphalt and Dirt Roads," C. R. Stokes, manager highway department, N. L. A. (H. W. Wood to discuss dirt roads).

2:30 p. m.—"Opportunities in the Industrial Field," L. B. Burt, manager industrial department, N. L. A. (discussed by H. E. Fitzroy).

Charles Warner, president, National Lime Association

4 p. m.—Ladies' afternoon tea (by courtesy of French Lick Springs hotel).

7 p. m.—Banquet, compliments of the French Lick Springs hotel. Entertainment furnished through the courtesy of the Valve Bag Company of America.

Thursday, June 10

Morning

10 a. m.—Executive session: "What Is Wrong with the Lime Industry?" W. E. Carson, president, Riverton Lime Co. Full discussion by membership. Adjourned business meeting of full membership. Reports of committees.

Afternoon

12:30 p. m.—Lunch.

1:30 p. m.—"There Is No Substitute," J. S. Elwell, manager, construction department, N. L. A. (discussed by C. M. Cadman).

2:15 p. m.—"The Practical Aspects of Research," G. J. Fink, director Association Laboratories, N. L. A. (discussed by G. T. Weigart).

3 p. m.—Directors' meeting.

8:30 p. m.—Round-table (manufacture—second session).

Field day—Tournament finals in golf, tennis, quoits and bridge.

Trophies which have been provided through the courtesy of the Valve Bag Co. of America will be awarded at a special buffet supper.

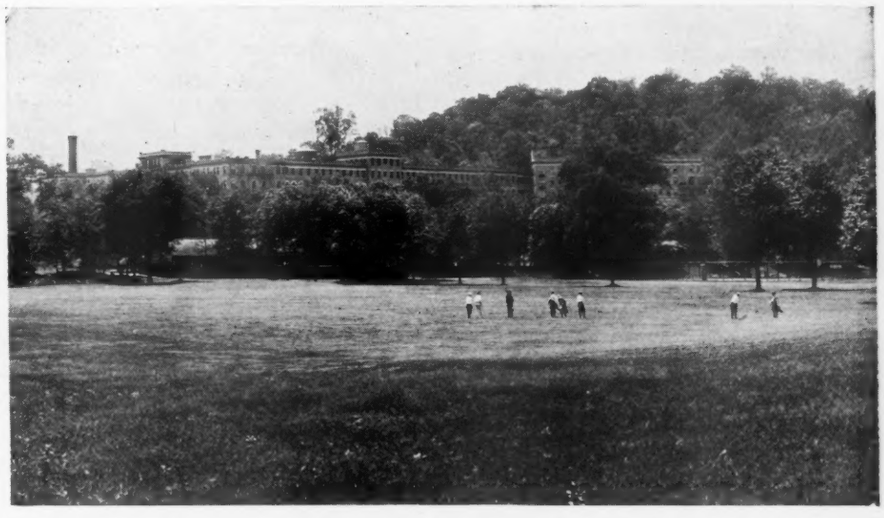
To Discuss Mineral Resources

AT the meeting of the Institute of Politics to be held at Williamstown, Mass., July 29 to August 26, "Mineral Resources in Their Political Relations" will be discussed by H. Foster Bain, of New York; Charles K. Leith, of the University of Wisconsin, and Charles H. MacDowell, of Chicago.

Refractory Brick from Natural Sillimanite

BRICK made of natural sillimanite have been tested in steam boilers with great success, it being found that they withstood high temperature conditions much better than any of the usual refractories.

A large deposit of sillimanite has recently been discovered in India, about 100 miles from Calcutta, and near a railway.



A golf tournament to be played on this beautiful course of the French Lick Springs hotel will be a feature of the convention

E. S. Hanson Joins Editorial Family of Rock Products

E. S. HANSON has become a member of the editorial staff of ROCK PRODUCTS, and begins his duties with this issue. It is hardly necessary to introduce Mr. Hanson to the members of the rock products industry. As editor and correspondent of other journals serving the same field he has met many of them, and those who have not made his personal acquaintance know him through his writings. He has been a regular attendant at conventions of the various industries both as editor and occasionally as speaker on topics of interest to the members. In fact, there are few men who have kept in touch with the development of the industry for so long a time.

E. S. Hanson

Mr. Hanson received his education at the University of Wisconsin and has spent the greater part of his life in editing trade and technical papers. The respect and friendship that he has won have always been valuable assets for the papers he represented and we are sure than the readers of ROCK PRODUCTS will welcome his coming, as do the other members of the organization.

American Highway Building Will Never Be Completed

IN other words, we can say that we have only begun the work toward a completed, adequate system of highways in this country, and with the exhaustion of the state and local funds for which the credit of the state or county or other local division has been pledged, as these funds become exhausted the federal aid funds will become more and more a factor in preserving a construction program and in carrying forward the completion of this major highway system in an adequate manner.

I think that this statement is necessary to bring out squarely the facts so that there can be no question, no attitude of mind reached, that we are about done or well along on our way in this building of roads.

Within a reasonable time limit a system of 200,000 miles of main roads for this country will never be built, because they will always be in progress of construction and improvement, just the same as your railroads are in that status today. It is true that they put traffic through some 60 or 70 years ago, and ever since that time it has been necessary to improve as traffic increased and as heavier units came upon them, so that the railroads are in a constant state of approaching the more adequate type; and so it is with the highways; and that, in my judgment, is the attitude of mind with which we ought to approach this question of highway building.—*Thomas H. McDonald, Chief of Bureau of Public Roads, in American Highways.*

Tennessee's Marble Deposits

HERBERT R. SHIPLEY, secretary-manager of the Chamber of Commerce, Lenoir City, Tenn., has compiled some interesting facts on the marble deposits near Lenoir. These deposits are part of the Concord belt which shows near Sweetwater, Tenn., and extends northeast through Loudon county and along Lenoir up to Concord. Running closely and almost parallel is the Southern railway and Tennessee river, while lines of the Tennessee Electric Power Co. of Chattanooga are located near it. Quarries have been opened, but most of the output has come from the vicinity of Concord, a few miles northeast of Lenoir City. Mr. Shipley also points out that excellent transportation facilities are available, and that deposits opened have been found very satisfactory. He states that waste from the marble quarry operations could be manufactured into valuable by-products such as aggregate, road stone, flux, terrazzo and lime.

Low Cost of Dredging Gold Bearing Gravel in California

THE operation of dredging gravel and washing it for gold in California is much the same as that of dredging and washing sand and gravel and sizing it into commercial products. Hence the costs of one business should compare readily with the costs of the other.

The Natomas Co. of California recently issued its annual report. It dredged 14,399,689 yd. of gravel at a cost of $920,397.19, which included taxes, insurance, and rental of land in addition to the ordinary expenses of labor, power, repairs, and superintendence. This figures out to 6.17 cents per cu. yd. Five dredges worked the whole year and two others part of the year. The actual production per dredge for one year was a little over 2,500,000 yd.

There was some expense connected with gold saving, but none of the material was crushed. Neither was any of it loaded on to cars. The expense of loading on to cars might easily have raised the cost 33 to 50%, and if the gravel contained many boulders the expense of crushing might have been twice as great as the cost of digging. Nevertheless the figures are very low and can only be accounted for by the large yardage handled.

The dredges used in gold dredging are ladder dredges of the type so much used on the Ohio and other eastern rivers.

Stewart Sand Company Builds Filter Sand Plant

THE Stewart Sand Co. of Kansas City, Mo., is building a plant to produce filter sand. It is placed near the "sand plant that looks like a distillery," which was shown in the April 17 issue of ROCK PRODUCTS. The discharge from one of the five classifiers shown will be used as raw material from the plant. This will be reclassified in another classifier of the same type and then run over two Hum-mer screens for final separation.

Plant for producing filter sand being built by the Stewart Sand Co.

The idea of reclassifying is to leave as little for the fine screens to do as is possible. Experiments indicate that the classifier will leave only 4% to 5% to be removed by the fine screen.

The making of special sands has been carried on much more in the eastern states than in the Middle West. But with the ever increasing use of these sands it may be expected that more plants for producing them will be built.

Greater New York Sand Dealers' Association Under Fire

AN investigation of the Greater New York Sand and Gravel Dealers' Protective Association, was ordered by Supreme Court Justice William F. Haggarty in Brooklyn, on a petition by Attorney General Albert Ottinger, who alleged the association was a combination of building material men formed to fix prices throughout the city. The court appointed Edward J. Byrne, president of the Brooklyn Bar Association, to act as referee at the public hearings on the charges, which were begun on May 17 at the Kings County Court building.

The association was organized a short time ago (see ROCK PRODUCTS, May 15 issue) and its application for incorporation was approved by Supreme Court Justice Norman S. Dike in Brooklyn. At that time the association announced its purposes to include "fostering trade and commerce in sand, gravel, ashes, broken stone and cement," and to "reform abuses in the trade."

It was charged by the attorney general that the main object of the association was to eliminate competition and to fix the price of fine or silica sand used in the cement facing of buildings. In his affidavit he further charged that independent dealers or nonmembers of the association would not be permitted to get this commodity unless they agreed to the terms of the association.

All of which the attorney general held was in violation of Sections 340-346 of the General Business Law. He also declared that the alleged price fixing would tend to increase the cost of building construction and to increase the cost of rentals to tenants. Deputy Attorney General Sol Ullman was assigned to conduct the investigation.

The officers and the directors of the association were named in the petition.

The Seaboard Sand and Gravel Co., described as wholesaler and sole distributor of silica sand in New York, is cited in the petition as a party to the inquiry.

All the charges were denied by the officers of the association.—*New York Times.*

[Two sessions of the hearing were held and a third was scheduled for May 27, at which time certain association records requested by the attorney general were to be produced. From the present indications it is said that the association was well within its legal rights.]

Jacob Eichel

JACOB EICHEL, 84, a pioneer in the sand and gravel industry, and treasurer of the Evansville Sand and Gravel Co., died on May 6 at his home in Evansville, Ind.

Born in 1842 in Offwiller, Alsace, France, he came to America when only 14 and settled in Evansville with relatives. His first position was that of a clerk in a grocery store at $2.50 per week. Educating himself, he was at the head of several businesses in his early twenties. Construction then gained his attention and he began an era of engineering activities that lasted for over 50 years. Many of the engineering works along the Ohio river were built under his direction as well as the first paved roads and electric light plant in Evansville.

Together with his son, William Eichel, he was the dominating interest in the Evansville Sand and Gravel Co., all the stock of which is owned by Mr. Eichel's family. This

Jacob Eichel, a pioneer in the rock products industries

company and the companies it succeeded, also founded by the elder Mr. Eichel, have been dredging and selling gravel in the lower Ohio river valley for half a century. The Evansville Sand and Gravel Co.'s chief plant is at Golconda, Ill., with a stone quarry nearby.

In past years, Mr. Eichel was president of the Ohio River Contract Co. and the Evansville Contract Co. and was largely interested in the Parkersburg and Marietta Sand Co., Eichel Lime and Stone Co., Eichel and Arnold, Eigenmann and Hollerbach, etc.

Wagner Quarries Co. Receives Large Filter Stone Contract Award

ONE of the largest contracts for crushed stone ever made was that which was awarded recently to the Wagner Quarries Co. of Sandusky, Ohio. The stone is in sizes ranging from 1½ to 2 in. and the contract calls for 223,000 cu. yd. The price to be received is $1.85 a ton or $2.53 per cu. yd. The company was represented in the bidding by the Supply Distribution Corp. of Cleveland, Ohio.

This stone is to be used in the trickling filters to be installed by the city of Akron, Ohio. On another page there is a description of the work and on the qualifications which stone should have to be suitable for trickling filters. J. E. Root, sewage engineer of the Department of Public Service, Akron, gives the necessary requirements in the current *Engineering News-Record* as follows:

(1) Hardness, not less than 14%. (2) Toughness, not less than 5. (3) Wear, not more than 6. (4) The stone shall show no sign of checking, cracking or disintegration after 20 successive treatments by the sodium sulphate test. The tests for hardness, toughness and wear follow the standard method of testing stone for road construction.

Botzum Brothers, Akron, Ohio (Dolomite Products Co.'s quarry, Narlo, Ohio), $1.80 per ton.

W. F. Wright Co., Akron, Ohio (miscellaneous quarries), $1.85 per ton.

Wagner Quarries Co., Sandusky, Ohio, $1.85 per ton.

Bluffton-Lewisburg Stone Co., Lima, Ohio, $1.87 per ton.

The France Stone Co., Toledo, Ohio, $1.90 per ton.

J. B. Loomis Co., Akron, Ohio, $2 per ton.

Material from the quarries of the first three bidders was subjected to the tests provided in the specifications, after which the contract was awarded to the Wagner Quarries Co.

This is considered important to the whole limestone industry, as some engineers thought hard rocks should be used.

One of the plants of the Wagner Quarries Co. of Sandusky, Ohio, which recently received a contract for 223,000 yd. of crushed stone for filtering purposes

Portland Cement Output in April

Shipments Increase but Stocks Still High

APRIL shipments of Portland cement showed an increase over the last month but are still about 9% lower as compared with April, 1925, according to the Bureau of Mines, Department of Commerce. Production shows a decrease of 1,400,000 bbl., and stocks of Portland-cement while still high are about 3% lower than the last month and are almost 9% higher than in April, 1925. The following tables, prepared by the Division of Mineral Resources and Statistics of the Bureau of Mines, are compiled from reports for April, 1926, received direct from manufacturing plants except two for which estimates were necessary on account of lack of returns.

Clinker Stocks

Stocks of clinker, or unground cement, at the mills at the end of April, 1926, amounted to about 12,853,000 bbl. compared with 12,284,000 bbl. (revised) at the beginning of the month.

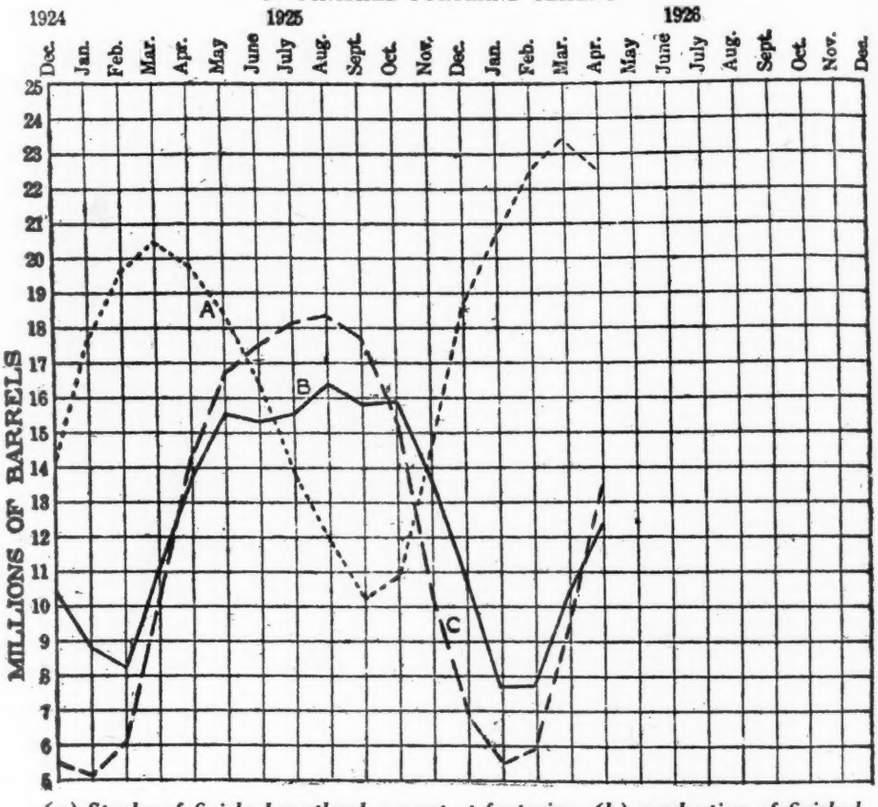
An estimate of the unground clinker by months is given below.

ESTIMATED CLINKER (UNGROUND CEMENT) AT THE MILLS AT END OF EACH MONTH, 1925 AND 1926, IN BBLS.

Month	1925	1926
January	7,017,000	9,074,000
February	8,497,000	10,931,000
March	9,962,000	*12,284,000
April	9,731,000	12,853,000
May	9,053,000	.....
June	7,937,000	.....
July	6,961,000	.....
August	5,640,000	.....
September	4,561,000	.....
October	4,086,000	.....
November	5,013,000	.....
December	6,469,000	.....

* Revised.

MONTHLY FLUCTUATIONS IN PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT


1924
1925
1926
Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
MILLIONS OF BARRELS
25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5
A
B
C

(a) Stocks of finished portland cement at factories; (b) production of finished portland cement; (c) shipments of finished portland cement from factories

Distribution of Cement

The following figures show shipments from Portland cement mills distributed among the states to which cement was shipped during February and March, 1925 1926:

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES, IN FEBRUARY AND MARCH, 1925 AND 1926, IN BARRELS*

Shipped to—	February 1925	February 1926	March 1925	March 1926
Alabama	103,513	145,636	177,510	158,310
Alaska	.....	264	294	917
Arizona	25,945	28,956	27,009	54,916
Arkansas	44,352	55,984	72,198	66,712
California	753,123	714,783	1,029,118	1,156,509
Colorado	69,871	51,068	102,537	81,623
Connecticut	50,026	29,323	113,668	78,962
Delaware	9,444	6,437	21,766	22,386
District of Columbia	65,176	47,086	58,474	63,249
Florida	227,811	445,674	272,094	402,888
Georgia	98,569	86,417	140,634	139,781
Hawaii	.....	15,830	1,500	24,737
Idaho	11,029	19,524	17,667	42,131
Illinois	378,947	429,654	846,638	569,978
Indiana	143,464	121,253	255,597	189,947
Iowa	52,039	50,077	161,164	116,367
Kansas	120,405	114,296	212,402	182,003
Kentucky	68,970	56,249	115,222	88,756
Louisiana	97,638	84,706	98,193	96,214
Maine	5,238	19,084	21,702	18,302
Maryland	98,231	77,537	143,291	132,720
Massachusetts	134,591	57,390	257,381	168,271
Michigan	248,240	253,661	437,712	399,036
Minnesota	97,034	72,714	173,618	164,405
Mississippi	28,564	47,179	35,778	58,308
Missouri	162,992	202,914	379,157	332,104
Montana	6,093	9,867	16,450	17,203
Nebraska	46,281	49,054	99,780	121,456
Nevada	5,177	5,754	7,254	8,824
New Hampshire	15,911	12,750	27,592	18,043
New Jersey	243,534	163,588	498,227	424,812
New Mexico	10,320	14,308	18,865	18,594
New York	587,674	434,323	1,159,830	1,026,883
North Carolina	128,770	139,656	200,097	271,422
North Dakota	3,742	4,903	16,589	23,260
Ohio	271,075	250,265	592,069	419,623
Oklahoma	155,083	167,043	203,161	206,766
Oregon	60,816	58,991	103,813	117,611
Pennsylvania	421,519	351,940	808,636	745,142
Porto Rico	.....	.....	.....	.....
Rhode Island	17,908	10,166	54,083	34,838
South Carolina	73,312	56,022	72,929	69,811
South Dakota	14,528	18,848	40,697	38,194
Tennessee	87,499	86,871	116,856	117,610
Texas	345,057	364,107	381,320	367,833
Utah	16,821	15,613	28,567	37,117
Vermont	3,060	1,640	10,312	5,052
Virginia	95,942	77,572	132,891	121,765
Washington	90,669	77,936	151,814	152,534
West Virginia	56,629	45,121	85,703	89,054
Wisconsin	73,320	80,066	142,620	155,826
Wyoming	9,181	11,710	16,358	12,225
Unspecified	26,430	52,720	46,236	36,878
	5,961,563	5,794,530	10,205,073	9,467,908
Foreign countries	53,437	25,470	73,927	71,092
Total shipped from cement plants	6,015,000	5,820,000	10,279,000	9,539,000

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1925 AND 1926, IN BARRELS

Month	Production 1925	Production 1926	Shipments 1925	Shipments 1926	Stocks at end of month 1925	Stocks at end of month 1926
January	8,856,000	7,887,000	5,162,000	5,672,000	17,656,000	20,582,000
February	8,255,000	7,731,000	6,015,000	5,820,000	19,897,000	*22,384,000
March	11,034,000	*10,355,000	10,279,000	*9,539,000	20,469,000	*23,200,000
First quarter	28,145,000	*25,973,000	21,456,000	*21,031,000	.....	.....
April	13,807,000	†12,403,000	14,394,000	†13,112,000	*19,882,000	†22,491,000
May	15,503,000	.....	16,735,000	.....	18,440,000	.....
June	15,387,000	.....	17,501,000	.....	16,409,000	.....
Second quarter	44,697,000	.....	48,630,000	.....	.....	.....
July	15,641,000	.....	18,131,000	.....	13,896,000	.....
August	16,419,000	.....	18,383,000	.....	11,952,000	.....
September	15,939,000	.....	17,711,000	.....	10,247,000	.....
Third quarter	47,999,000	.....	54,225,000	.....	.....	.....
October	15,992,000	.....	15,309,000	.....	10,979,000	.....
November	13,656,000	.....	10,187,000	.....	14,534,000	.....
December	10,713,000	.....	6,917,000	.....	18,365,000	.....
Fourth quarter	40,361,000	.....	32,413,000	.....	.....	.....
	161,202,000	.....	156,724,000	.....	.....	.....

* Revised. † Includes estimate for two plants and subject to revision.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN APRIL, 1925 AND 1926, AND STOCKS IN MARCH, 1926, IN BARRELS

Commercial District	Production—April 1925	Production—April 1926	Shipments—April 1925	Shipments—April 1926	Stocks at end of April 1925	Stocks at end of April 1926	St'ks at end of March 1926
Eastern Pa., N. J. & Md.	3,337,000	3,258,000	3,808,000	3,679,000	4,571,000	5,311,000	5,732,000
New York	731,000	518,000	771,000	811,000	1,232,000	1,336,000	1,629,000
Ohio, Western Pa. & W. Va.	1,275,000	1,198,000	1,276,000	1,180,000	2,017,000	2,721,000	2,703,000
Michigan	868,000	762,000	865,000	610,000	1,326,000	1,932,000	1,780,000
Wis., Ill., Ind. & Ky.	1,957,000	†1,413,000	2,140,000	†1,562,000	3,555,000	†3,817,000	3,966,000
Va., Tenn., Ala. & Ga.	1,111,000	1,259,000	1,134,000	1,311,000	682,000	1,059,000	1,111,000
Eastern Mo., Iowa, Minn. & S. Dak.	1,347,000	1,133,000	1,316,000	1,142,000	3,303,000	3,078,000	3,087,000
Western Mo., Neb., Kans. & Okla.	1,063,000	854,000	1,029,000	898,000	1,596,000	1,443,000	1,487,000
Texas	405,000	412,000	451,000	447,000	295,000	501,000	536,000
Colo. & Utah	224,000	219,000	217,000	†202,000	312,000	†223,000	206,000
California	1,096,000	1,009,000	1,090,000	958,000	521,000	552,000	*501,000
Ore., Wash. & Mont.	393,000	368,000	297,000	312,000	472,000	518,000	462,000
	13,807,000	†12,403,000	14,394,000	†13,112,000	19,882,000	†22,491,000	*23,200,000

* Revised. † Figures include estimate for one plant each in Indiana and Utah and are subject to revision.

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN MARCH, 1926

Imported from	District into which imported	Barrels	Value
Belgium	Florida	193,075	$337,360
	Los Angeles	10,122	12,915
	Me. & N. H.	11,223	25,509
	Massachusetts	24,824	45,900
	Mobile	26,904	41,011
	New Orleans	17,068	30,792
	Oregon	8,501	10,896
	Philadelphia	88,266	138,096
	Porto Rico	757	522
	San Francisco	6,094	7,735
	Washington	17,522	29,410
	Total	404,356	$680,146
Cuba	Florida	12	$60
Denmark and Faroe Islands	Florida	14,148	$22,466
	Porto Rico	47,142	71,793
	Total	61,290	$94,259
France	New York	1,495	$2,635
Germany	Los Angeles	101	$215
	New Orleans	1,716	1,494
	Total	1,817	$1,709
Japan	Hawaii	1,501	$2,336
Norway	Florida	14,895	$22,475
	Philadelphia	48	$56
	Total	14,943	$22,531
United Kingdom	Florida	1,888	$2,423
	Los Angeles	1,102	3,321
	New York	95	430
	Porto Rico	4,742	3,118
	Total	7,827	$9,292
	Grand total	493,241	$812,968

EXPORTS AND IMPORTS* EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES, IN MARCH, 1926

Exported to—	Barrels	Value
Canada	461	$2,804
Central America	7,798	22,283
Cuba	15,166	33,544
Other West Indies	553	1,487
Mexico	7,651	23,397
South America	31,764	95,871
Other countries	5,687	26,261
	69,080	$205,647

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO IN MARCH, 1926*

	Barrels	Value
Alaska	522	$ 1,817
Hawaii	18,697	41,513
Porto Rico	5,005	11,560
	24,224	$54,890

* Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

IMPORTS AND EXPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1925 AND 1926

Month	Imports 1925 Barrels	Imports 1925 Value	Imports 1926 Barrels	Imports 1926 Value	Exports 1925 Barrels	Exports 1925 Value	Exports 1926 Barrels	Exports 1926 Value
January	231,258	$364,196	360,580	$576,717	71,596	$207,547	72,939	$216,431
February	119,077	206,308	314,118	527,948	56,249	181,356	73,975	220,706
March	218,048	337,039	493,241	812,968	65,248	200,410	69,080	205,647
April	197,686	280,826	(†)	(†)	89,508	263,831	(†)	(†)
May	186,897	286,959	.....	.....	85,385	250,845	.....	.....
June	254,937	409,539	.....	.....	71,343	217,899	.....	.....
July	335,118	499,602	.....	.....	98,141	286,543	.....	.....
August	379,847	611,551	.....	.....	103,961	289,904	.....	.....
September	513,252	789,121	.....	.....	102,649	285,225	.....	.....
October	535,050	824,268	.....	.....	73,369	228,467	.....	.....
November	388,604	678,518	.....	.....	101,825	294,201	.....	.....
December	295,543	526,001	.....	.....	100,323	296,900	.....	.....
	3,655,317	$5,813,928	.....	.....	1,019,597	$3,003,128	.....	.....

† Imports and exports in April, 1926, not available.

Calaveras Cement Celebrates Completion of New Plant

THE formal opening of the new $200,000 cement plant of the Calaveras Cement Co. near Valley Springs, Calif., was celebrated by a free barbecue and entertainment for all visitors. Delegations from several Chambers of Commerce were present as well as many public officials.

The new plant uses the wet process, operating two kilns, 240 ft. 11 ft. 3 in. in diameter, which are the largest on the coast. Production of the plant will be about 3500 bbl. per day. The plant is served by an overhead crane and Fuller-Kinyon pumps are used to transport cement to the concrete storage silos, of which there are four, with a total capacity of about 70,000 bbl. The company operates its quarry with Armstrong drills and Bucyrus shovels, one steam and one electrically driven.

The company was privately financed and the officers are: William Wallace Mean, president; Steven L. Rawlins, vice-president; George Poore, vice-president; William Macnider, sales manager; H. A. Henry, superintendent of plant.

Cement Material Available By Mining Methods

RECENT investigations into the limestone deposits of Green county, New York, with particular reference to their further utilization for cement manufacture, indicate that beyond the better known deposits is one to which underground mining methods may perhaps be applied with profit.

This includes the western leg of the eroded anticline of the Becraft deposit, as described by Robert W. Jones in *Engineering and Mining Journal-Press*, and he says that this narrow three-mile ledge cannot be brought under production by ordinary quarry methods. To the west of this ledge, however, test holes indicate that the entire series of limestone beds is present below the Esopus sandstone at an elevation which would make it convenient for mining and transportation.

There are no indications of serious disturbances, and a good roof is present in the hard limestones of the Port Ewan formation. This leaves a workable face of about 60 ft. of high lime, with the ground-water level sufficiently low to avoid trouble from that source.

Traffic and Transportation

EDWIN BROOKER, Consulting Transportation and Traffic Expert
Munsey Building, Washington, D. C.

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning May 24:

Central Freight Association Docket

13122. **Sand**, except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding or silica, and gravel, carloads, Hugo, O., to points in Ohio and Pennsylvania, as follows:

To	
Brecksville, O.	80
Corland, O.	80
Coshocton, O.	110
Farrel, Pa.	105
Garrettsville, O.	80
Leavittsburg, O.	80
Leetonia, O.	80
Lisbon, O.	90
Lorain, O.	90
Lowellville, O.	90
Mantua, O.	80
Medina, O.	90
New Castle, Pa.	105
Rittman, O.	90
Sharon, Pa.	105
Sharpsville, Pa.	105
Sterling, O.	90
Walford, Pa.	105
Wellington, O.	100
West Middlesex, Pa.	105

13189. **Sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), or gravel, carloads, Vincennes, Ind., and Allison Branch, Ill., to Mitchell, Ind. Present rate, 95 cents per net ton; proposed, 90 cents per net ton.

13192. **Sand and gravel**, carloads, Navarre, Ohio, to various points in Ohio. Present rates, sixth class; proposed, to Hammondsville, Ohio, $1; Kensington, Ohio, 90 cents; New Salisbury, Ohio, $1; Salineville, Ohio, 90 cents; Summitville, Ohio, 90 cents; Yellow Creek, Ohio, $1.

13204. **Sand and gravel**, carloads, Fair Oaks, Ohio, to Ava, Pleasant City, Derwent and Byesville, Ohio. Present rate, $1.10 per net ton; proposed, 90 cents per net ton.

13216. **Crushed stone**, carloads, Holland, Ohio, to Steiner, Mich., and Erie, Mich. Present rates, 12 cents to Steiner and 10 cents to Erie, Mich. (sixth class); proposed, 80 cents per net ton to Steiner and 76 cents per net ton to Erie, Mich.

13217. **Crushed stone**, carloads, Holland, Ohio, to Manitou Beach, Mich. Present rate, $1.22 per net ton; proposed, 90 cents per net ton.

13222. **Crushed stone**, carloads, Durbin, Ohio, to Lima, Ohio. Present rate, 13½ cents (sixth class); proposed, 90 cents per net ton.

13255. **Lime**, agricultural, carloads, Marble Cliff, Ohio, to points in C. F. A. territory, except points in the state of Ohio. Present rate, sixth class; proposed, rates on basis of 70% of sixth class, carloads, minimum weight 36,000 lb.

13259. **Sand** (blast, engine, finishing, foundry, glass, loam, marl, molding and silica), carloads, Cheswick, Penn., to Warwood and Wheeling, W. Va. Present rate, 15 cents; proposed, $1.39 per ton.

13272. **Crushed stone**, carloads, Buffalo, N. Y., and points taking same rates, to Erie, Fairview, North Girard and Swanville, Penn. Present rates, from Buffalo, N. Y.:

To—	(Per net ton) Rate
Erie, Penn.	$1.15
Fairview, Penn.	1.25
North Girard, Penn.	1.25
Swanville, Penn.	1.25

Proposed, $1.05 per net ton.

13274. To establish on **crushed stone, crushed stone screenings** and tailings, when shipped in bulk (other than ground or pulverized agricultural limestone, ground or pulverized limestone, fluxing stone or raw dolomite, fire stone and silica rock or silica stone), carloads, the following rates:

From Kokomo, Ind., to Vermont, Ind., Greentown, Ind., Sycamore, Ind., Sims, Ind., Swayzee, Ind., Herbst, Ind., Roseburg, Ind., Marion, Ind., 60 cents; Hanfield, Ind., Landess, Ind., Van Buren, Ind., 76 cents; Warren, Ind., 88 cents.

13286. **Sand and gravel**, carloads, Harbor Bridge, Penn., to Reidsburg, Penn.; from Pittsburgh to Reidsburg, Penn. Present rate, 21½ cents (sixth class); proposed, from Harbor Bridge, Penn., to Reidsburg, Penn., rate of $1.40 per ton of 2000 lb.; from Pittsburgh, Pa., to Reidsburg, Penn., rate of $1.60 per ton of 2000 lb.

13288. **Mica waste or schist**, carloads, minimum weight 80,000 lb., Chicago, Ill., to Rutherford, N. J., applicable only as a proportional rate on traffic originating at Keystone, S. D., or other points in the Black Hills district. Present rates, classification basis; proposed, $5 per ton.

13294. **Sand and gravel**, carloads, minimum weight as per Information Circular 3235, Wolcottville, Ind., to Chicago, Ill. Present rate, sixth class; proposed, 80 cents per net ton.

13295. **Crushed stone**, carloads, Cleveland, O., to Barberton, O. Present rate, 80 cents per ton; proposed, 70 cents per ton.

Southwestern Freight Association Docket

8209—**Silica**, from Alapco, Ark., to interstate points. To establish the following rates in cents per 100 lb. on silica, carloads, minimum weight 50,000 lb., from Alapco, Ark., to points shown below:

To	Rate
Atchison, Kan.	27½
Brisbane, Ill.	33½
Buffington, Ind.	33½
Chicago, Ill.	33½
Chicago Heights, Ill.	33½
Cincinnati, Ohio	27½
Council Bluffs, Iowa	38½
Dyer, Ind.	33½
East Chicago, Ind.	33½
East St. Louis, Ill.	23
East Joliet, Ind.	33½
Gary, Ind.	33½
Griffith, Ind.	33½
Hammond, Ind.	33½
Hartsdale, Ind.	33½
Indiana Harbor, Ind.	33½
Joliet, Ill.	33½
Kansas City, Mo.	27½
Matteson, Ill.	33½
Newark, N. J.	59½
New York, N. Y.	59½
North Kansas City, Mo.	27½
Omaha, Neb.	38½
St. Joseph, Mo.	27½
St. Louis, Mo.	23
South Chicago, Ill.	33½
South St. Joseph, Mo.	27½
South Omaha, Neb.	38½
Trenton, N. J.	59½
Whiting, Ind.	33½

Deposits of silica have been discovered at Alapco, Ark., and at the present time there is nothing in effect other than through Class D rates, which are prohibitive.

8333. **Lime**, from points in Arkansas to Morgan City, La. To establish a rate of $5.50 per ton of 2000 lb. on lime, carloads, minimum weight 30,000 lb., from Limedale Spur and Ruddells, Ark., to Morgan City, La. The proponent calls attention to the fact that there is a large paper mill under construction at Morgan City, La., and when completed and in operation will require considerable amount of lime. The present rates from Ruddells and Limedale Spur will not permit them to place any lime at this point, in competition with other producing points.

8445. **Sand and gravel**, from Arkalon, Kan., to Amarillo, Texas. To establish rate of 11 cents per 100 lb. on sand and gravel, carloads, minimum weight marked capacity of car, except where cars are loaded to full visible or space carrying capacity, in which event actual weight will govern, but in no case less than 60,000 lb., from Arkalon, Kan., to Amarillo, Texas. The present class rate is prohibitive and interested shippers advise a rate not higher than 11 cents is necessary in order to move the traffic.

Illinois Freight Association Docket

2913-C—**Sand and gravel**, carloads, minimum weight 90% of marked capacity of car, except that when car is loaded to full visible capacity, actual weight will apply, from Muscatine, Iowa, to Mt. Carroll, Ill. Present, 6 cents; proposed, 5 cents.

3657—**Stone**, ground or pulverized (in bulk), crushed or rough quarried, in straight or mixed carloads, minimum weight 90% of marked capacity of the car, except that when cars are loaded to full visible capacity actual weight will apply, but not less than 40,000 lb., from Columbia Quarry No. 2 and Krause, Ill., to C. & A. R. R. stations, viz.: Boyle, Clarke, King, Titus, Bakersfield, East Hardin and Reardon, Ill. Present, combination rates apply; proposed, $1.40 per net ton.

2355-B—**Sand**, molding, minimum weight 90% of marked capacity of car used, from Wilmington, Ill.

To	Rates per net ton. Present	Proposed
Lake Mills, Wis.	180	160
Watertown, Wis.	180	160

3649—**Sand and gravel**, minimum weight marked capacity of car, from Pekin and Peoria, Ill., to Wabash Ry. stations, Clarksdale to Honey Bend, inclusive. Present, combination rates; proposed, $1.13 per ton.

3656—**Sand and gravel**, minimum weight 90% of marked capacity of car, except when car is loaded to full cubical capacity, actual weight will apply, but not less than 40,000 lb., from Shawneetown, Ill. Present, class rates or lowest combination; proposed (representative points), to Vermillion, Ill., $1.26 per net ton; Pinkstaff, Ill., $1.13; Mt. Carmel, Ill., $1.01; Brownsville, Ill., 88 cents.

3660—**Sand**, molding, from and to various points in Illinois Rate Committee territory. Minimum weight, present, various; proposed, marked capacity of car, except when car is loaded to full visible capacity actual weight to apply, but not less than 40,000 lb.

3666—**Sand and gravel**, from LaGrange, Mo., to Kinderhook, Barry and Pittsfield, Ill. Rates in cents per net ton. Present, Class E; proposed, $1.13.

3667—**Sand and gravel**, crushed stone and cinders, carloads, from Moline, Ill., to Pelasant Valley, Iowa. Present, 43 cents; proposed, 47½ cents.

3668—**Sand and gravel**, from St. Louis, Mo., and East St. Louis, Ill., to points on the B. & O. R. R. in Illinois (rates per net ton).

To (representative points)	Present	Proposed
Caseyville, Ill.	76	62
Salem, Ill.	88	74
Flora, Ill.	126	88
Millersville, Ill.	126	100
Rinard, Ill.	139	88

2787-B—**Sand and gravel**, carloads, from Koss Spur, Iowa. Present—To Chadwick, Ill., $1.37; to Milledgeville, Ill., $1.43; proposed, to Chadwick, Ill., 90 cents; to Milledgeville, 90 cents.

3013 A—**Gravel**, novaculite or gannister, carloads, from Wolff Lake, Ill. (rates in cents per net ton):

To—	Present	Proposed
De Soto, Ill.	101	75½
Bush, Ill.	113½	75½

3611-A—**Lime**, carloads, from Hannibal-Marblehead district to stations on the C. C. C. & St. L. Ry. in Indiana and Illinois, viz., Terre Haute, Paris, Mattoon, Shelbyville, etc. Present, 16 cents; proposed, 15 cents.

3670—**Sand and gravel**, carloads, from Chillicothe, Ill. Present, to Virginia and Jerseyville, Ill., class rate; proposed, to Virginia, Ill., $1.07 per net ton; to Jerseyville, Ill., $1.28 per net ton.

Trunk Line Association Docket

13291—(A) **Lime**, building, carloads, minimum weight 30,000 lb. (B) **Lime**, agricultural, chemical, gas, glass or land, carloads, minimum weight 30,000 lb., from Knickerbocker to Blue Bell, Penn., inclusive, Norristown and Devault, Penn., to:

	(A)	(B)
Easton, Penn.	.....	12½
E. & N. Jct. to Easton (13th St.), Penn.	13½	12½
New Market to Phillipsburg, N. J.	.....	12½
South Easton to Mt. Carmel, Penn.	.....	12½
Bowmans, Penn.	.....	12½
From Temple to Leesport, Penn., to South Easton to Lizard Creek Junction, Penn.	.....	12½
Bowmans to Lehighton, Penn.	.....	12½

The above rates in cents per 100 lb.

Reason—To place all Easton, Penn., stations on the L. V. R. R. on the same basis as published to Easton, Penn., stations for C. R. R. of N. J. delivery and to place the rates on the so-called "low grade" limes to points other than Easton stations on the proper basis by correcting a tariff error. File 39233.

13362. (a) **Sand** (other than blast, engine, foundry, glass, molding or silica) and gravel, carloads. (b) Sand, blast, engine, foundry, glass, molding or silica, carloads, from Erie, Penn., to Tionesta Valley Ry. stations, Sheffield Tannery to Hallton, Penn., incl. (a) $1.60 per net ton and (b) $1.80 per net ton.

Reason—The proposed rate is the same as at present published from Machias, N. Y., and also compares favorably with the rates from Buffalo, N. Y. File 39866.

13367 (increase). To establish rates on **oyster shell lime**, carloads, minimum weight 30,000 lb., to Pennsylvania Railroad points from Baltimore, Md., rates ranging from $1.98 to $3.20 per net ton, from Crisfield, Md., rates ranging from $2.80 to $4.20 per ton of 2000 lb. Reason—Proposed rates from Baltimore, Md., are based upon the rates now carried by the B. & O. and W. Md. Rys., from Baltimore, Md., to the same points of destination as per B. & O. R. R. Tariff I. C. C. 19287 and Western Maryland Railway Tariff I. C. C. 7400. Proposed rates from Crisfield, Md., are based 3 and 5 cents per 100 lb. over the proposed rates from Baltimore, Md., which is the recognized basis in establishing rates on this commodity from Crisfield, Md. It was necessary in a few cases to depart from the 3 and 5 cent basis to avoid Fourth Section Violations. File 39891.

Southern Freight Association Docket

26716—**Crushed stone**, etc., from Clermont, Ga. (G. & N. W. R. R.), to Jacksonville, Fla. In lieu of present rate of $1.98 per net ton it is proposed to establish the following rates on stone, crushed stone, rubble; stone screenings, slag chert, sand and gravel (washed or unwashed), minimum weight 90% of marked capacity of car, except when cars are loaded to their full visible capacity, actual weight will govern, from Clermont, Ga.: To Jacksonville, Fla., proper, $1.90; for beyond, $1.85 per net ton; made with relation to rates from other Southeastern and Carolina shipping points to Jacksonville.

26728—**Ground limestone and ground marl**, carloads, from N. & L. Ry. shipping points to A. C. L. R. R. stations in North and South Carolina. In lieu of combination basis it is proposed to establish rates on ground limestone and ground marl, carloads, minimum weight 60,000 lb., from N. & W. Ry. shipping points, viz., Alco, Austinville, Carmine, Carson, Cloverdale, Coling, Marion Pontmours, Riverton, 213 Mill Siding and Saltville, Va., to points in North and South Carolina on the A. C. L. R. R., made in line with present rates from Mascot, Tenn. Statement of present and proposed rates will be furnished upon request.

26745—**Sand**, from Dixiana, S. C., to Powers, Roziers and St. Paul, N. C. In lieu of combination basis it is proposed to establish rate of $1.86 per net ton on sand (except molding sand), carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity actual weight will apply, from Dixiana, S. C., to the destinations named, made on basis of the proposed Georgia scale, less 10%, for joint application over trunk and short lines.

26748—**Crushed stone**, etc., from Nichols Quarry, Ala., to Biloxi, Miss. Class A now applies. Proposed on stone, broken or crushed, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity actual weight will govern, from Nichols Quarry, Ala., to Biloxi, Miss., $1.80 per net ton, which is the same as the current rate on broken stone, carloads, from Boyles and Dolcito, Ala., to Biloxi, Miss.

26767—**Sand and gravel** between Virginia points and Norfolk Southern R. R. local stations. It is proposed to publish between Virginia points of origin shown in Agent Cottrell's Virginia-Carolina Commodity Tariff, I. C. C. 570, taking Rate Group numbers 1 to 9, inclusive; 12 to 21, inclusive; 25, 53 and Norfolk Southern R. R. local stations in North Carolina, viz.: Nooe's to Ridgeview, inclusive; Vina Vista to Dewey, inclusive; Fuquay Springs to Tokay, inclusive; the same rates on sand and gravel, carloads, as are now published to and from the common points to which the above stations are intermediate.

26769—**Sand**, from N. S. R. R. Electric Division stations to N. & W. Ry. stations. It is proposed to publish reduced rates of $2.16 per net ton on sand, carloads, minimum weight 100,000 lb. (90% of marked capacity of car is less than 100,000 lb., such 90% of marked capacity will apply as minimum), except when cars are loaded to their visible capacity the actual weight will govern, from Norfolk Southern R. R. Electric Division stations to branch line points on the Norfolk & Western Ry. in Kentucky located on Pond Creek Branch, Leckie Spur Branch, Blackberry Branch, Pinson Fork Branch, Buck Creek Branch, Poplar Creek Branch, Freeburn Branch and McCarr Branch. The proposed rate is the same as now in effect to points on the N. & W. Ry. for the same and greater distances.

26773—**Lime**, from Ladds and Portland, Ga., to Guntersville, Ala. Present rate, $3.21 per net ton (Attalla combination). Proposed on lime, carloads, minimum weight 30,000 lb., $2.60 per net ton, made on basis of the suggested fourth section committee of Southern Carriers' scale, using the distance from Ladds, Ga.

26781—**Lime**, from Knoxville, Tenn., etc., to Sale Creek, Tenn. Present rate on lime, carloads, minimum weight 30,000 lb., from Knoxville, Marble City, Luttrel land River Front Extension, Tenn., to Sale Creek, Tenn., $2.35 per net ton. Proposed, $2.14 per net ton, same as rate in effect from Summitville, Tenn.

26790—**Ground limestone and ground marl**, from N. & W. Ry. shipping points to S. A. L. Ry. Carolina stations. It is proposed to publish a full line of rates on ground limestone and ground marl, carloads, minimum weight 60,000 lb., from N. & W. Ry. shipping points to points in North and South Carolina on the S. A. L. Ry., made in line with rates in effect from Mascot, Tenn., distance considered. Statement of present and proposed rates will be furnished upon request.

26797—**Sand**, from Dixiana, S. C., to Savannah, Ga. It is proposed to establish reduced rate of $1.13 per net ton on sand (except molding sand), carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity, actual weight will govern, from Dixiana, S. C., to Savannah, Ga., same as the present rate on stone, crushed, carloads, from Columbia and Cayce, S. C., to Savannah, Ga.

26807—**Broken stone**, etc., from Frankfort, Ky., to Kentucky points. It is proposed to establish the following commodity rates on crushed stone or broken stone, carloads, minimum weight 90% of marked capacity, actual weight of marked capacity of the car, except when cars are loaded to their visible capacity, actual weight will govern, from Frankfort, Ky., to apply in lieu of class rates:

To—	In cents per net ton
Midway, Ky.	57
Lexington, Ky.	57
Shelbyville, Ky.	68
Maysville, Ky.	120
Versailles, Ky.	59
Nicholasville, Ky.	72

The proposed rates are made with relation to rates from and to other points in the same general territory.

26825—**Sand and gravel**, from Brooklyn, Miss., to Theodore, Irvington, St. Elmo and Grand Bay, Ala. No through rates in effect. Proposed rate on sand and gravel as described in Item 9634, Agent Speiden's I. C. C. 929, from and to points mentioned, 7 cents per 100 lb., or $1.40 per net ton, same as rate applicable from Hattiesburg, Miss.

26831—**Slate or stone**, crushed or pulverized, from Jacksonville, Fla. (from beyond), to Tampa, Fla. It is proposed to cancel the present rate of $1.24 per net ton on slate or stone, crushed or pulverized, carloads, minimum weight 90% of marked capacity of car, from Jacksonville (from beyond), Fla., to Tampa, Fla., which applies only on shipments originating at Fairmont, Ga., allowing class rate to apply. The cancellation proposed will place all shipping points on a parity.

26847—**Crushed stone, sand and gravel** between Norfolk Southern R. R. stations. It is proposed to publish for interstate application between all Norfolk Southern R. R. stations (except not applicable to or from Norfolk or Suffolk, Va.) mileage scale for application on stone, crushed; sand and gravel (washed), straight or mixed carloads, minimum weight 100,000 lb. The proposed scale ranges from 55 cents for five miles up to $1.27 per 100 miles, $1.74 for 250 miles, $1.84 for 300 and $2.08 for 400 miles. Class "A" rates are at present applicable.

26848—**Crushed stone**, from Neverson, N. C., to Bayville, Va. In lieu of present rate of $2.25 per net ton, it is proposed to establish on stone, crushed, carloads, minimum weight 100,000 lb. (when 90% of marked capacity of car is less than 100,000 lb., such 90% of marked capacity will apply as minimum), except when cars are loaded to their visible capacity, the actual weight will govern, from Neverson, N. C., to Bayville, Va., rate of $1.64 per net ton, which is in line with other rates for similar distances in the same general territory.

Amdt. 1 to 26686—**Lime**, from Watauga, Tenn., to East Tennessee points. Submittal 26686, docketed for public hearing Monday, May 10, 1926, proposes certain rates on lime, carloads, minimum weight 30,000 lb., from Watauga, Tenn., to East Tennessee points. In lieu of the rates formerly proposed, the following rates are now suggested: To Bristol, Va.-Tenn., 5½ cents; Elizabethton, Tenn., 5½ cents; Johnson City, Tenn., 3½ cents, and Kingsport, Tenn., 7½ cents per 100 lb., these rates being made on basis of the carriers' proposed lime scale.

26861 (shippers). **Sand**, from Columbus, Miss., to Memphis, Tenn. In lieu of present rate of 11½ cents per 100 lb., it is proposed to establish on sand, carloads, minimum weight, marked capacity of car, from Columbus, Miss., to Memphis, Tenn., rate of $1.20 per net ton, or the same as the current rate on gravel, carloads.

26894. **Silica sand**, from St. Louis, Mo., and group to Birmingham, Ala., Chattanooga, Tenn., Macon and Rome, Ga. In lieu of Class A rate, it is proposed to establish the following commodity rates on sand, silica, not ground or pulverized, in packages or in bulk, carloads, minimum weight 60,000 lb., from St. Louis Mo., and group: To Birmingham, Ala., $3.55 per net ton, based $1.07 per ton over the current rate on molding sand from Cincinnati, Ohio, to Chattanooga, Tenn., $3.32 per net ton, based $1.07 per ton over the present rate on silica sand from Louisville, Ky.; to Macon and Rome, Ga., $4 and $3.55 per net ton, respectively, based $1.07 per ton over current rates on molding sand from Louisville, Ky.

26908. **Sand and gravel**, from Montgomery, Ala., to Abbott, Mertz and Theodore, Ala. In lieu of present $1.94 per net ton rate, it is proposed to establish on sand and gravel, the property of the state, county or municipality, when consigned thereto or to an officer thereof, in bulk, in straight or mixed carloads, minimum weight marked capacity of car, from and to points named, rate of $1.44 per net ton, made on basis of the proposed Georgia scale for the short line distance from Montgomery to Theodore, Ala.

26931. **Gravel and sand**, from Brooklyn, Miss., to Mobile, Ala. No through rate in effect. Proposed rate on gravel and sand, carloads, for good roads purposes only, minimum weight 10% less than marked capacity of car, $1.50 per net ton, same as rate in effect from Saratoga, Miss., to Mobile and also in line with rates in effect from Hattiesburg, Miss., to points in Alabama intermediate to Mobile.

26935. **Sand and gravel**, from Louisville, Ky., to Paris, Ky., and local stations on the L. & N. R. R. Paris and Lexington Branch. Present rate, 6½ cents per 100 lb.; proposed rate on sand and gravel, straight or mixed carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity, actual weight shall govern, $1.13 per net ton, which is in keeping with the rates in effect from Cincinnati and Louisville to Lexington and the rate from Cincinnati to Paris.

26985. **Ground limestone**, from Cartersville, Ga., and Sparta, Tenn., to Newburgh, N. Y. In lieu of Cincinnati, Ohio, combination, it is proposed to establish on ground limestone, carloads, minimum weight marked capacity of car, except when car is loaded to full visible capacity, actual weight will apply, from Cartersville, Ga., and Sparta, Tenn., to Newburgh, N. Y., same as applicable to New York, N. Y.

26995. **Sand and gravel**, from Carrollton, Ky., to High Bridge and Dry Ridge, Ky. In lieu of combination basis it is proposed to establish the following rates on sand and gravel, straight or mixed carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity, actual weight shall govern, from Carrollton, Ky.: To High Bridge, $1.77; to Dry Bridge, $1.54 per net ton. The purpose of the proposal is to enable the Carrollton shippers to meet competition at Louisville, Ludlow, Ky., and Cincinnati, Ohio.

26998. **Sand and gravel**, from Montgomery to Wetumpka, Ala. In lieu of present rates of 80 cents per ton on gravel, carloads, and 73½ cents per ton on sand, carloads, it is proposed ot establish on sand and gravel, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity, actual weight will govern, intrastate rate of 59 cents per net ton, or the same as produced by the proposed Georgia-Alabama scale of trunk lines other than the L. & N. R. R., less 10%.

27049. **Stone**, rough quarried, from 28 Mile Siding, Ala., to Mobile, Ala. Present rate, 7 cents per 100 lb.; proposed rate on stone, rough quarried or broken, carloads, minimum weight marked capacity of car, from and to points named, 80 cents per net ton.

27084. **Crushed stone**, from Mullins, Ky., to Conway, Ky., and intermediate L. & N. R. R. stations. It is proposed to revise the present rate on stone, crushed, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity, actual weight will govern, from Mullins, Ky.

To—	Present. In cents per 100 lb.	Proposed. In cents per net ton
Conway, Ky.	4	60
L. & N. R. R. stations, Donara, Ky., to Roundstone, Ky., inc.	3½	60

The rate proposed to Conway is for the purpose of permitting shippers at Mullins, Ky., to compete with shippers located about 4½ miles from Conway, while the rate to other points is made no higher than proposed to Conway.

27095. **Sand**, from Sawyers Mill and Lipe, Tenn., to southeastern points. It is proposed to extend rates on sand from Sawyers Mill, Tenn., to southeastern points to be also applicable from Lipe, Tenn., and to the extent rates are at present in effect from Lipe, Tenn., with no corresponding adjustment from Sawyers Mill, Tenn., the rates from Lipe to be made applicable from Sawyers Mill, Tenn.

Western Trunk Line Docket

2269-D. **Sand and gravel**, carloads, from Dallas City, Ill., to Ottumwa, Iowa, 90 miles. Present, 11 cents per cwt.; proposed, 7 cents per cwt. From Gladstone, Ill., to Ottumwa, Iowa, 84 miles. Present, 11 cents per cwt.; proposed, 7 cents per cwt. Minimum weight 90% of marked capacity of car, except that when actual weight of shipment loaded to full visible capacity of car is less than 90% of marked capacity of car, the actual weight will be the minimum weight, but in no case less than 40,000 lb.

4823-A. **Limestone, ground**, carloads, from Ziegler, Kan., to Kansas City and St. Joseph, Mo.

To—	Present Cents	Proposed Cents
Kansas City, Mo.	8	6½
St. Joseph, Mo.	9	8

Minimum weight, standard basis.

Sand Rates from Lafayette, Ind., Found Unreasonable

RATES on sand and gravel from Lafayette, Ind., to points in Illinois, effective July 2, have been prescribed in No. 15559, Western Indiana Gravel Co. vs. New York, Chicago & St. Louis et al., mimeographed. The commission, by division No. 3, in a report written by Commissioner Cox, has found present rates on those articles unreasonable and unduly prejudicial.

This decision covers matters not dealt with in Lafayette Gravel Co. vs. C. & E. I., 62 I. C. C. 729, nor in I. and S. Nos. 2306 and 2307, two cases that grew out of the formal docket case against the C. & E. I. Rates agreed upon in conference following the cases mentioned became effective January 1 last. The questions remaining after that adjustment were whether joint commodity rates should be established to points in Illinois listed in an appendix presented herewith, and, if so, should the Wabash be required to absorb the switching charge of the Nickel Plate at point of origin. The Illinois Central took the position that there was no necessity for joint commodity rates and that producers of sand and gravel near the points of demand should get such business because single-line hauls were less expensive than jointline hauls and that it was desirable to do away with cross-hauling and expensive interchange service as well as delays in the movement of traffic.

The commission came to the conclusion that there was no necessity for absorption by the Wabash but that there should be joint-line commodity rates, to displace joint sixth class rates, as follows:

From Lafayette, Ind., in connection with the Wabash and— Illinois Central to—	Distance Miles	Rates Prescribed Cents
Tomlinson	76	115
Laurette	94	115
Leroy	107	115
Mattoon	118	115
Arcola	104	115
Tuscola	96	115
Champaign	84	115
Ludlow	79	115
Staley	88	115
Greens Switch	123	115
Turpin	125	125
Sullivan	123	125
Coles	124	125
Elwin	125	125
Assumption	142	135
Pana	152	135
Ramsey	170	135
Vandalia	182	135
Baltimore & Ohio to—		
Rochester	166	123
Pana	165	123
Tower Hill	172	123
Cowden	178	123
Moccasin	169	123
Altamont	163	123
Kankakee & Urbana to—		
Urbana	82	93
Champaign	84	93
Rantoul	98	93
Wesslund Park	106	98
Illinois Traction to—		
Westville	52	90
Ridge Farm	62	90
Bronson	56	94
Glover	67	94
Urbana	77	100
Champaign	80	100
Monticello	99	108
Bement	108	108
Decatur	129	108
Riverton	161	111
Maroa	143	111
Clinton	151	111
Bloomington	175	111
Mackinaw	195	120

*To apply also to local points intermediate to the destinations shown. —*Traffic World.*

Lime Rate from Ohio Unreasonable

A FINDING of unreasonableness and undue prejudice, with an award of reparation and an order for the future, have been proposed by Examiner J. P. McGrath, in No. 17317, Woodville Lime Products Co. vs. Pennsylvania et al., as to a combination rate of 27.4 cents, from Woodville, Ohio, to Fulton Station, Baltimore, Md. He said the rate should be found unreasonable to the extent it exceeded 25.5 cents, the rate for which the complainant contended. He said that that rate should be established over a reasonably direct route and that there was no need for the rate over the circuitous route over which the existing combination applied, namely, Pennsylvania to Columbus, Ohio, New York Central to Charleston, W. Va., Baltimore and Ohio and Western Maryland to Walbrook Station, Baltimore, at a total of 25.5 cents, plus 38 cents per ton from Walbrook Station to Fulton Station.

Dismiss Complaint on Rates on Ground Limestone

THE Interstate Commerce Commission, by division No. 4, has dismissed No. 16958, Thompson, Weinman and Co., Inc., vs. New Haven and Hartford et al. (mimeographed), finding that three carload shipments of ground limestone from Sparta, Tenn., to Fairfield, Conn., shipped in June and September, 1924, were overcharged. It found that the applicable rate, under the Sligo Iron Store rule, was $7.43 per ton on the shipments that moved July 3, 1924, and that a rate of $7.73 was applicable on two shipments which moved in September. It said there was no evidence of record challenging the reasonableness of the applicable rates. It therefore found them not unreasonable or otherwise unlawful. The rates charged were $8.43, $8.58, and $8.63.

Reduce Gravel Rates to Mobile

RATES on washed gravel, and sand, carloads, from Montgomery to Mobile, Ala., were reduced recently by the Alabama public service commission, in a decision in the case of the Alabama Sand and Gravel Co. and Roquemore Gravel Co. vs. Louisville and Nashville railroad.

The commission held the present rate of $1.44 per net ton to be excessive and reduced it to $1.13. —*Montgomery (Ala.) Journal.*

North Dakota Short Haul Gravel Rates Lowered

THE North Dakota state railroad board has ordered a reduction in freight rates on gravel for short hauls to become effective on or before May 31. The decision settled three pending cases, the Riverside Gravel Co. of Mandan, C. R. Stone of Fargo and the board on its own motion. The rates apply only to the Northern Pacific, Great Northern and Soo Lines.

Sand Rates from Sand Springs (Okla.) Prejudicial

A FINDING of undue prejudice and an order to remove it not later than July 1, have been made in No. 16081, Arkansas River Sand Co. vs. Missouri-Kansas-Texas et al. (mimeographed), as to rates on sand from Sand Springs, Okla., to points in Kansas and Missouri. The Interstate Commerce Commission, by division 3, found them not unreasonable but unduly prejudicial against shippers at Sand Springs and unduly preferential of shippers at Osage, Okla., to the extent they exceeded, exceed or may exceed the contemporaneous rates over defendants' lines from Osage.

Crushed Rock Reparation Ordered

EXAMINER W. A. HILL, in No. 17251, Board of Park Commissioners vs. Chicago, Milwaukee and St. Paul et al., has recommended a finding of unreasonableness as to a rate on crushed rock, from Dresser Junction, Wis., to Minnehaha, Minn., applied on about 175 carloads shipped in 1923 and 1924. He said the commission should find the rate of 5 cents per 100 lb. and the switching charge of $1.80 per car unreasonable to the extent the charges exceeded those which would have accrued at a rate of 3.5 cents and award reparation to that basis.

Core Sand Rate Unreasonable

A FINDING of unreasonableness, an award of reparation and an order for the future have been proposed by Examiner William H. Smith, in No. 17422, H. B. Smith Co. vs. New York, New Haven and Hartford et al., as to a rate on core sand, from Provincetown to Westfield, Mass., over an interstate route. Smith said the Interstate Commerce Commission should find the 15-cent rate in effect between the points in issue, prior to February 17, 1924, was and the rate of 14.5 cents after that day was and will be unreasonable to the extent it exceeded and exceeds 12.5 cents.

Woodville Lime Rates Unreasonable

EXAMINER F. L. SHARP in No. 17374, Washington Building Lime Co. vs. Pennsylvania et al., proposes the commission shall find rates on lime from Woodville, Ohio, to stations on the Western Maryland east of Walbrook, in Baltimore, Md., unreasonable and unduly prejudicial to the extent that they have exceeded, exceed or may exceed the rates and charges contemporaneously maintained from the same point to other destinations in Baltimore and unduly prejudicial to the extent they have exceeded, exceed or may exceed the rates from Luckey, Ohio, to Western Maryland destinations in Baltimore and award reparation to that basis.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Largest Block Plant on West Coast of Florida

Florida Nu-Tex Tile Co. Operates Ten Tile Machines and Makes Other Precast Units

THE Florida Nu-Tex Tile Co. is said to operate the largest plant for the making of concrete building units on the west coast of Florida. It has ten machines making Anchor "Hightest" tile, a form of unit that is a great favorite at the present time. The plant is on the bank of the river and almost in the heart of Tampa, being only two or three blocks from the main business section.

The company also makes many precast units, the use of which is extensive in Florida, although some of these are not used elsewhere. One kind which is peculiar to the state is the concrete post on which almost all wooden houses are supported. These posts are about 2 ft. high, about a foot square at the bottom, and taper toward the top. They are set on flat square bases of concrete and serve to keep the house high enough from the ground to insure a good circulation of air. This keeps the timbers from rotting.

The main product of the plant, however, is made up of the "Hightest" tile. The aggregate used is Lake Wales sand without any mixture of coarse aggregate which is scarce in Florida, and the trade has become familiar with the smooth looking blocks of sand-cement concrete and seems to prefer them.

The blocks as they are made are placed on wooden pallets which look like a child's bench. Each holds two blocks. They are stacked up six high and then wheeled to the steam curing rooms where they are left over night and then wheeled into the yards. In making this transfer ordinary baggage trucks are used. The laborer simply puts the lip of the truck under the stack of six pallets with the blocks on them and wheels the truck to wherever they need to go. All the transferring of green tile is done by this method.

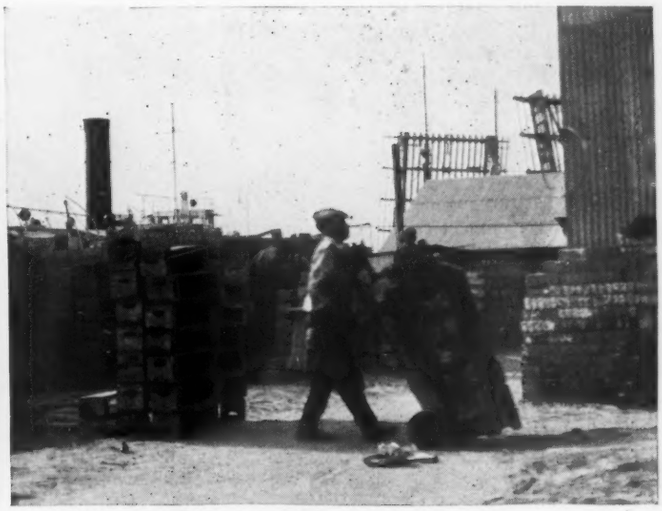
A much used precast unit

The concrete is mixed in continuous mixers which consist of a trough with a shaft inside. This shaft has paddles on it that thoroughly mix the sand and cement and urge it forward. Water is added by a sprinkling arrangement. The sand is fed to the mixer by a chain elevator with rather small buckets and the cement is run in from a hopper.

There are no bins for aggregate. The sand is received in a shed from which it is taken to the boot of the elevator by wheelbarrows.

The plant was a very busy place on the day that it was visited with trucks loading out the material at about the same rate that it was brought from the machines to the

Larger forms of precast units



Method of conveying green blocks

curing rooms. The output is large, but the demand is so strong that the foreman complained there was "never a chance to get any ahead."

Dyestuffs for Coloring Concrete

VERY great interest has been aroused by the publication of preliminary details regarding the proposed use of dyestuffs for the coloration of concrete, cement and other building materials, using for this purpose dyestuffs instead of mineral earth colors or pigments. The technical work has been carried out under the direction of Dr. G. N. White, of London, and the results obtained are favorably regarded in competent quarters. The following details may be of interest:

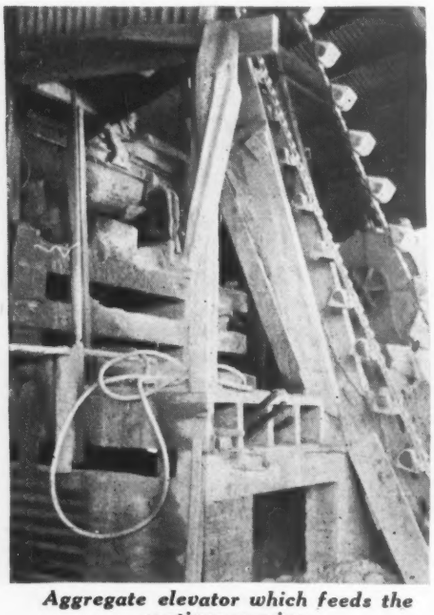
"The new process employs those organic dyestuffs which have the greatest fastness to light, moisture, and other atmospheric effects, and which in the finished state are completely insoluble in water. The color range of such dyestuffs available for use in the building trade is very extensive, and there seems no reason why concrete should not be tinted to produce any color scheme.

"The process is simple, and is equally applicable to the coloring of concrete for use in mass or as blocks. The concrete is gaged, not with water and the color in powder form, but with a solution of some simple derivation of the coloring matter. On exposure to the air, or by other simple treatment, the coloring matter is thrown down in a permanent insoluble form upon the cement particles.

"The difficulty in coloring concrete by means of pigment in powder form is to grind down the particles of pigment more finely than those of cement. If they are larger, the cement particles will cover them with a cement dust, and tend to produce a greyish effect. But the extreme fineness of cement makes it practically impossible to grind down any pigment into particles that are smaller than those of cement. If this could be done, a color effect might be obtained with the use of a smaller quantity of pigment.

"This, however, is really the basis of the new process. By working with a solution of a derivative color or, in rather less exact language, a solution of the color, one actually employs the pigment in the most perfect state of sub-division possible. Although on precipitation there is doubtless a sort of coagulation, the precipitation occurs on the surface of the cement particles. The result is that quite a satisfactory depth of shade can be produced by the use of no more than 0.1% to 0.6% of coloring matter, calculated on the dry weight of the concrete.

"It is noteworthy that the depth of tint depends only on the ratio of dyestuff to cement; and, so long as this is constant, it is immaterial as far as the color is concerned, to what extent sand or other aggregate is added. Thus, a 7:1 mixture of sand and cement containing a 0.06% of dye has practically the same depth of shade as pure cement containing 0.4% of dye. This brings out very clearly the dependence of methods of coloring concrete upon the area of the particles to be colored, since the addition of, say 86 parts of sand to 14 parts of cement increases the total particle area of the mixture by only some 5%.—*Chemical and Metallurgical Engineering.*



Aggregate elevator which feeds the continuous mixer

Interior of the Florida Nu-Tex Tile Co.'s plant at Tampa, Fla.

Pacific Coast Association

C. B. ROGERS has been elected president of the Southern California Rock Products Association, succeeding W. J. Van Valkenburg, resigned. Guy R. Varnum has been elected vice-president to serve out the term of Mr. Rogers.

Columbus Association Elects Officers

THE Columbus Concrete Products Association, Columbus, Ohio, at a recent monthly meeting, elected officers for the ensuing year.

Al. C. Dale was elected president; M. Reichter of the Reichter Concrete Block Co. was elected vice-president, and G. M. Friel was re-elected secretary-treasurer.

At a previous meeting a committee was appointed to secure competitive bids of the block manufacturers in Columbus. A discussion was made on this subject and W. F. Walker gave an interesting talk on manufacturing costs.

The peculiar type of pallet used in this plant

"Aerocrete," a Porous Concrete Used for Making Blocks in Europe

The Combination of a Light Aggregate and a Porosity Secured by Chemical Means Makes a Light Weight Block

By J. Gustaf V. Lang, E.E., M.E.

ABOUT a year ago, while on a visit to Sweden, my attention was called to a new building material which had gained recognition and a rapidly expanding employment over there.

I was shown numerous old buildings where an additional story had been added in this new material. I saw cottages built in blocks made of this material — foundation, walls, partitions and floors. I was invited to inspect a plant where blocks had been turned out in ever-increasing quantity until its capacity was strained to its limit.

On my return to the United States I made an investigation as to whether any similar materials were on the market, but the only thing I could find of similar character was a product made by an entirely different method.

The original development in Sweden, for which Axel Eriksson is responsible, was based on the idea of utilizing large quantities of shale ash, to be found in different parts of Sweden, which are remnants from old lime and alum industries, when oil shale was used as fuel in burning the limestone and as a source of alum.

This shale ash is mixed with lime and cement and a small amount of a metallic powder is added to produce the porosity by hydrogenation. The mass is then moulded into blocks, slabs or reinforced door and window-beams.

The spokesmen for this group, with whom I came in contact, seemed rather noncommittal as to the suitability of this material for "in situ" work. There were, however, plenty of evidences of extensive use of their blocks and slabs; for instance, in one of the two "skyscrapers" of Stockholm, a 17-story building, the outside walls are built of 20 cm. (8-in.) slabs of this material.

A large printing house has recently been erected with double walls of 10 cm. slabs with air space between the slabs. This mode of construction was adopted with a view of obtaining perfect sound-proofness.

Another Swedish group recognized from the start the drawback in a development of this kind, of tying themselves to a material which is found only in certain localities, and based their developments on the utilization of aggregates of more universal availability. They experimented with sand, cinders, furnace slag and numerous other materials, which may lend themselves to the purpose.

Extensive experimental and development work was conducted by K. P. Billner, an expert on concrete construction with many years' experience in our western states. His work was sponsored by the Valleviken Cementfabrik of Stockholm, one of the important cement mills in Sweden.

The raw materials which have come to more general use as aggregate by this group are ordinary cinders and furnace slag. Besides producing blocks and slabs in this material by moulding in large forms and cutting to desired size, by means of steel wires, after the mass has taken its initial set, considerable construction has been done by mixing the material on the building place and casting "in situ."

The accompanying photographs show a few buildings erected of this material. Special attention is drawn to the railway station at Eskilatuna and to the postoffice annex erected for the Swedish government from Aerocrete blocks. It will be noted from the latter that the building authorities in Sweden permit the use of this material as bearing material in buildings of only two or three stories.

Other pictures show old buildings on which an additional story has been built in Aerocrete, cottages of Aerocrete and a courtyard above a cellar space covered in this material.

After this development was well under way in Sweden, Mr. Billner proceeded to London and interested English architects and contractors in this new product. An Aerocrete cottage was erected at the Wembley Exposition and created quite a sensation.

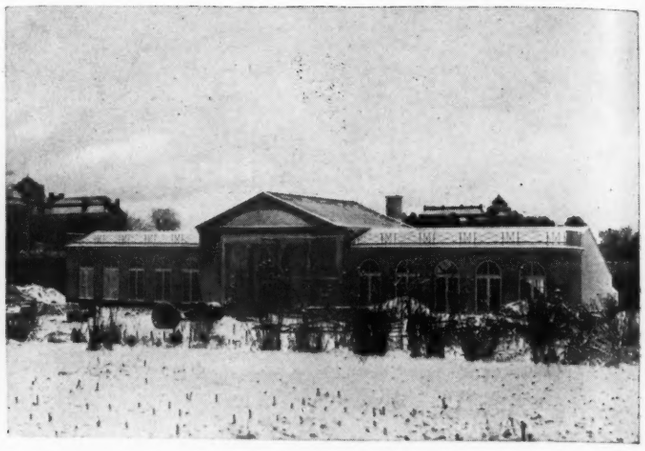
The possibilities of this material was given rapid recognition by the English in spite of their generally recognized conservatism.

Aerocrete was specified and used for cas-

On account of its light weight "Aerocrete" is much used for upper stories on old buildings

New central station postoffice in Stockholm, built of "Aerocrete" with reinforced concrete lintels

A typical porous concrete house of many erected in Stockholm



Hothouse built of porous concrete which was cast in place

ing the steel structure, as well as for other purposes in Devonshire House. Since then, Aerocrete has been specified for floors in the new university of Cardiff, for an "indestructable paint" factory at Park Royal outside of London and Sketchley dye works near London, etc. The consulting engineers for the above factories report a saving of roughly, $30,000 and $15,000, respectively, or about 20% of the total building cost. (This as compared with brick construction.) Tenders are now being received on a total of 1500 houses involved in three housing schemes. Recently Aerocrete has been specified to be used extensively in the New Lloyd building.

The beautiful railroad station at Eskiltuna, Sweden, built of "Aerocrete" blocks

This rapid recognition accorded to the material in England carried the immediate acceptance of same in several of the English colonies. Australia and New Zealand were among the first, and a chain of operating companies has already been organized in these countries. Operations have also been under way for some time in Egypt.

Relatively, recently, the well-known contracting firm Siemens Bau-Union has started work on a contract for several hundred cottages in Palestine, which are being built in Aerocrete, and on the plan of horizontal moulds for the complete walls which are later raised into position.

The number and size of the voids in Aerocrete determine the lightness even though the quantity and quality of the aggregate has some influence. The lighter the material the less strength it has, but the strength can be varied to some extent by varying the mixture and the type of aggregate. The commonly used volume-weight runs between .8 to 1.0, in other words 50 to 60 lb. per cubic foot, or about 1/3 of the weight of ordinary concrete. The strength of this quality Aerocrete runs from 300 to 600 lb. per square inch (by cube test).

The heat conductivity coefficient varies from .24 to .33 (on the basis of the metric system of measurement). This corresponds to .60 for brick walls and 1.30 for ordinary concrete.

In addition to the above mentioned outstanding properties Aerocrete has the great advantage, as compared with practically all other materials, of similar lightness, of being fireproof.

Finally, Aerocrete has the great advantage of permitting easy working with ordinary wood-working tools. It can be sawed, grooved, spiked and screwed.

On the basis of the properties set forth above, it is evident that Aerocrete lends itself to certain definite purposes entirely aside from its general usefulness as a building material.

One of the great advantages of Aerocrete is the fact that the transportation cost per cubic yard to the building site is considerably lower than other materials. For all "in situ" work only about 1500 lb. of cement and aggregate per cubic yard have to be transported. Besides, precast slabs of considerably larger size can be handled due to the relatively reduced weight.

Finally, its lightness makes a success of the old idea of casting complete walls in horizontal form, to be subsequently raised into position. The saving in time and skilled labor by this method is self-evident.

Behavior of Pottery Flint Under Many Conditions

FINE grinding and the presence of impurities in pottery flint affect its firing behavior more than the type of flint used, according to an investigation recently completed by the Bureau of Standards.

Potters' flint, or pulverized quartz, is that constituent in a burned whiteware body which promotes rigidity of structure. Its effect in body compositions is to reduce the drying and burning shrinkage and usually to promote refractoriness. Flint has an important bearing on the resistance of bodies to thermal and mechanical shock, because of the volume changes which accompany its crystal transformations.

The most important effect of the type of flint is shown by the thermal expansion behavior of the bodies in which it is used. Quartz flints will produce bodies having greater resistance to thermal shock at temperatures below 200 deg. C.; for temperatures above 573 deg. C. cryptocrystalline quartz will give better results. Excessive amounts of impurities will tend to lower the refractoriness, and well-vitrified bodies may show the mechanical weakness caused by overfiring. Fine grinding of a relatively pure quartz flint lowers the maturing temperature of a body without significantly affecting the vitrification range.

Book Reviews

The Limestones of Wisconsin

Reviewed by Oliver Bowles

ANOTHER new bulletin on limestone has just appeared having the title "Limestones and Marls of Wisconsin," by Edward Steidtmann, with a chapter on the economic possibilities of manufacturing cement in Wisconsin by W. O. Hotchkiss and E. F. Bean. It is published as Bulletin 66 of the Wisconsin Geological and Natural History Survey.

This report of 208 pages, 6 plates, 19 figures and one map follows closely the publication of similar limestone reports for Illinois and Florida. It is based on unpublished notes, previous publications and field work done in 1912. Particular attention is given to the chemical composition of the rocks, and to uses depending on composition.

The carbonate rocks of Wisconsin are largely magnesian, most of them being classed as dolomites. Theories of the origin of dolomite are reviewed. Unlike the solid carbonate rocks the marls are mostly of the high calcium type. The nature and origin of the rocks are given in some detail. Following a discussion of the general geology of Wisconsin, the occurrences of limestones and dolomites are described by counties in alphabetical order. The marls, clays and shales are similarly described. Sources of raw materials in Wisconsin suitable for portland cement manufacture are fully covered. The most promising materials are marl and clay, as most of the limestones are too high in magnesium. The whole problem of manufacturing cement in Wisconsin, either from local materials, or from rock brought from outside the state is discussed thoroughly from every angle.

The only criticism that might be offered applies to the technologic section where a number of unfortunate errors appear, as for example, the statements that the limestone charge for a lime-burning rotary kiln is finely ground, that such rotary kilns are fired with ground coal, and that magnesian rock makes a viscous slag in the blast furnace. The treatment of origin and occurrence is excellent, and constitutes a valuable work of reference for those generally interested in limestone, as well as for those who have a particular interest in the rocks of Wisconsin.

A notable feature of the report is an appendix containing numerous analyses of dolomites, marls, clays, slates and shales. The joint author, William O. Hotchkiss, state geologist of Wisconsin, has recently been appointed president of the Michigan College of Mines at Houghton, Mich.

North Carolina Rock Products Industry

Reviewed by Oliver Bowles

THE MINERAL INDUSTRY OF NORTH CAROLINA FROM 1918 TO 1923, by Brent S. Drane and Jasper L. Stuckey. Economic Paper No. 55 of the North Carolina Geological and Economic Survey.

NONMETALLIC MINERALS predominate greatly in the mining activities of North Carolina. Mineral production in the state in 1923 totalled about $11,000,000. The two leading industries are granite, and brick and tile, each attaining a production of over $3,600,000. Next in order is sand and gravel valued at $1,400,000. While no portland cement is manufactured in the state, cement products, such as building blocks, drain tile, etc., occupy fourth place with a production of $560,000. Other important nonmetallic products are kaolin and pottery clay, feldspar, limestone, mica and talc. Mica is of outstanding importance because North Carolina has been the chief source of supply of domestic mica for many years, though recently New Hampshire has shared about equal honors. The mineral situation in the state is summed up by the authors very concisely by the statement that "North Carolina is well supplied with most of the nonmetallic minerals needed to serve the state's growth and development, and in addition to its own requirements is able to furnish to the industry of the country as a whole an important proportion of its requirements of kaolin, mica, feldspar, and granite."

All the useful minerals of North Carolina are tabulated alphabetically with locations. Thereafter both the metallic and non-metallic mineral industries are discussed individually in some detail. This book of about 100 pages is a very useful work of reference particularly to residents of the state, but also to others who are interested in minerals or their products.

Magnesite in California

Reviewed by Oliver Bowles

MAGNESITE IN CALIFORNIA, by Walter W. Bradley. California State Mining Bureau Bulletin No. 79.

MAGNESITE, the natural carbonate of magnesia, occurs in commercial quantities, in so far as we know at present, only in California and Washington. While a few other deposits are known, it is not believed that they can be economically developed under present conditions. California was the only producer up to 1916, after which important supplies were obtained from Washington. Almost the entire production up to 1914 was used in the sulphite process of manufacture of wood pulp paper. Thereafter the increased demand for refractories, and the cutting off of foreign supplies, led to a greatly increased production.

Since the war the demand for refractory magnesite has fallen off, but the expansion of other uses, particularly in the plastic trades, has maintained production at a considerably higher level than in the pre-war period.

The survey on which this bulletin is based was made in 1917, but publication was suspended owing to lack of printing funds. A re-survey was recently made to bring it up to date before publication.

The early history of the industry, and the properties and origin of magnesite are given briefly. The industrial uses are described under the following headings:

1. Refractory purposes.
2. Plastic purposes.
3. Manufacture of wood pulp paper.
4. Manufacture of carbonic acid gas.
5. Miscellaneous applications including heat insulation.
6. Manufacture of magnesia salts.
7. Manufacture of metallic magnesium.

The testing and specifications for magnesium oxychloride cements are given in detail. The locations of all known magnesite deposits in California are shown on a map. The chief producing counties in the order named are Santa Clara, Tulare, San Benito, and Napa. The peak of production was in 1917, exceeding 200,000 tons. In 1924 production was a little over 67,000 tons. The tonnage produced for each year from 1887 to 1924 is shown in tabular form.

The last 100 pages of the report are devoted to detailed descriptions of the deposits by counties in alphabetical order. The workings in the developed deposits are described, and in some instances illustrated by charts and photographs. The mills, kilns, and other outside establishments are described, and many of them are illustrated. The report, consisting of 147 pages, is well written, and is particularly welcome in view of the scarcity of literature on the subject.

Explosion Hazards of Pulverized Coal

A RECENT bulletin issued by the Bureau of Mines, Department of Commerce, presents both the bad and good features of pulverized coal plants and gives recommendations for safe installation and operation. Because of the increasing use of pulverized coal in the rock products industries it would be quite worth while for operators to obtain a copy from the bureau and carefully read its contents. This bulletin may be obtained by sending 25 cents to the Superintendent of Documents, Washington, D. C.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	.....	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.65	1.65	1.40	1.40	1.40
Cobleskill, N. Y.	1.50	1.35	1.25	1.25	1.25	.....
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Eastern Pennsylvania	1.35	1.35	1.35	1.35	1.35	1.35
Frederick, Md.	.50	.75	1.30	1.20	1.10	1.10
Munns, N. Y.	1.00	1.50	1.50	1.40	1.25	.....
Northern New Jersey	1.60	1.50@1.80	1.30@2.00	1.40@1.60	1.40@1.60	.....
Prospect, N. Y.	1.00	1.50	1.40	1.30	1.30	.....
Walford, Penn.	.70	1.35	1.35	1.35	1.35	1.50
Watertown, N. Y.	.50	.....	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Afton, Mich.	.....	.....	.50	.....	.....	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Bloomville. Middlepoint, Dunkirk, Bellevue, Waterville, No. Baltimore, Holland, Kenton, New Paris, Ohio; Monroe, Mich.; Huntington, Bluffton, Ind.	1.00	1.10	1.10	1.00	1.00	1.00
Buffalo and Linwood, Iowa	1.10	.....	1.10	.90	.95	.95
Chasco, Ill.	1.25	.....	.....	.....	.....	1.15
Columbia, Krause, Valmeyer, Ill.	1.00@1.50	1.20@1.25	1.20@1.25	1.20	1.20	1.50
			Flux 1.50@1.75			
Cypress, Ill.	1.15	1.15	1.15	1.15	1.05	1.00
Greencastle, Ind.	1.25	1.25	1.15	1.05	.95	.95
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
Milltown, Ind.	.....	.90@1.00	.75@ .85	.90@1.00	.85@ .90	.85
Northern New Jersey	1.30	.....	1.80	1.60	1.40	.....
River Rouge, Mich.	1.10	1.10	1.10	1.10	1.10	1.10
St. Vincent de Paul, Que.	.75	1.25	1.00	.90	.85	1.00
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Stone City, Iowa	.75	.....	†1.10	1.05	1.00	.....
Waukesha, Wis.	.90	.90	.90	.90	.90	.90
SOUTHERN:						
Alderson, W. Va.	.60	1.45	1.45	1.35	1.25	1.20
Allgood, Ala.			Crusher run, fines out, for flux, 1.00 per net ton			
Cartersville, Ga.	.....	1.50	1.50	1.25	1.15	1.10
Chico, Texas	1.00	1.35	1.30	1.25	1.15	1.10
El Paso, Tex.	1.00	1.00	1.00	1.00	.....	.....
Ft. Springs, W. Va.	.50	1.60	1.50	1.35	1.25	.....
Graystone, Ala.			Crusher run fluxing stone, 1.00 per net ton			
Henderson, N. C.	.....	.....	1.50	.....	1.25	.....
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
New Braunfels, Tex.	.30@1.00	1.00@1.30	1.00@1.30	.70@1.00	.70@ .90	.....
Olive Hill, Ky.	.50@1.00‡	1.00	1.00	1.00	1.00	1.00
Rocky Point, Va.	.50@1.00	1.40@1.60	1.30@1.40	1.15@1.35	1.10@1.20	1.00@1.05
WESTERN:						
Atkinson, Kans.	.25	2.00	2.00	2.00	2.00	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.25	1.25	1.25	1.25	1.10	.....
Kansas City, Mo.	.75	1.50	1.50	1.50	1.50	1.50
Limestone, Wash.	3.00	3.00	3.00	3.00	3.00	3.00
Rock Hill, St. Louis Co., Mo.	1.30	1.15	1.15	1.15	1.15	1.30

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Duluth, Minn.	.90	2.25	1.90	1.50	1.35	1.35
Dwight, Calif.	1.00	1.00	1.00	.90	.90	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Texas	2.50	2.00	1.55	1.35	1.25	.....
New Haven, New Britain, Meriden & Wallingford, Conn.	.80	1.70	1.45	1.20	1.05	1.05
Northern New Jersey	1.50	2.00	1.80	1.40	1.40	.....
Oakland and El Cerritto, Cal.	1.00	1.00	1.00	.90	.90	.....
San Diego, Calif.	.....	2.75	2.55	2.35	2.35	.....
Sheboygan, Wis.	1.00	1.10	1.10	1.10	1.10	.....
Springfield, N. J.	1.60	2.00	1.90	1.60	1.60	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Coldwater, N. Y.—Dolomite			1.50 all sizes			
Columbia, S. C.—Granite	.....	.....	1.75	.....	1.50	.....
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Havelock, Ontario	.....	2.60	2.10	2.10	.....	.....
Lithonia, Ga.	.75a	2.00	1.60	1.35	1.30	1.25
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.—Granite	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@2.00
Northern New Jersey (Basalt)	1.50	2.00	1.80	1.40	1.40	.....
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Pa. (sand-rock)	1.85@2.00a	.....	1.35@1.50	.....	1.00@1.50	.....
Toccoa, Ga.—Granite	.....	.....	1.60	1.45	1.40	.....

*Cubic yd. †1 in. and less. ‡Two grades. ‖Rip rap per ton. (a) Sand. (b) to ¾ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Dust. (f) ¼ in. (h) less 10c discount. (i) 1 in., 1.40.

Agricultural Limestone

(Pulverized)

Alderson, W. Va.—90% thru 50 mesh	1.50
Alton, Ill.—Analysis 99% $CaCO_3$, 0.3% $MgCO_3$; 90% thru 100 mesh	6.00
Asheville, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk	2.75
Atlas, Ky.—90% thru 100 mesh	2.00
50% thru 100 mesh	1.00
Belfast and Rockland, Me. (rail), Lincolnville, Me. (water), analysis $CaCO_3$ 90.04%; $MgCO_3$ 1.5%, 100% thru 14 mesh, bags	4.50
Bulk	3.50
Branchton and Osborne, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers)	5.00
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; pulverized; 50% thru 50 mesh	1.50
Cartersville, Ga.—Pulverized, 2.25; 90% thru 50 mesh	1.50
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Chico, Texas.—50% thru 50 mesh, bulk	1.75
Colton, Calif.—Analysis 90% $CaCO_3$, bulk	4.00
Cypress, Ill.—90% thru 100 mesh	1.35
Henderson, N. C. (paving dust)—80% thru 200 mesh, bags	4.25@ 4.75
Bulk	3.00@ 3.50
Analysis $CaCO_3$, 56%; $MgCO_3$, 42%; 65% thru 200 mesh, bags	3.95
Bulk	2.70
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.00; bulk	2.50
Knoxville, Tenn.—Analysis, 52% $CaCO_3$, 37% $MgCO_3$; 80% thru 100 mesh; bags, 3.75; bulk	2.50
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80 lb. paper sacks, 5.00; bulk	3.50
Marion, Va.—Analysis, 90% $CaCO_3$, pulverized, per ton	2.00
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 90% thru 100 mesh	3.90@ 4.50
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35@ 1.60
Olive Hill, Ky.—50% thru 50 mesh, 2.00; 90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100	2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk	3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rocky Point, Va.—Analysis 99.5% $CaCO_3$, 0.25% $MgCO_3$; 50% thru 200 mesh; bags, 3.25@3.50; bulk	2.00
Toledo, Ohio, 30% through 50 mesh	2.25
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.10
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50
West Stockbridge, Mass.—Analysis 90% $CaCO_3$, 50% thru 100 mesh; cloth bags, 4.75; paper, 4.25; bulk	3.25

Agricultural Limestone

(Crushed)

Alton, Ill.—Analysis 99% $CaCO_3$, 0.3% $MgCO_3$; 50% thru 4 mesh	3.00
Atlas, Ky.—50% thru 4 mesh	.50
Bedford, Ind.—Analysis, 98.5% $CaCO_3$, 0.5% $MgCO_3$; 90% thru 10 mesh	1.50
Blackwater, Mo.—Analysis, 99% $CaCO_3$; 90% thru 4 mesh	.75
Bridgeport and Chico, Texas—Analysis, 94% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	1.75
50% thru 4 mesh	1.50
Chasco, Ill.—50% thru 100 mesh	1.20
Chico, Texas—50% thru 4 mesh; bulk	1.50

(Continued on next page)

Agricultural Limestone

Chicago, Ill.—50% thru 100 mesh; 90% thru 4 mesh	.80
Columbia, Krause, Valmeyer, Ill.—Analysis, 90% $CaCO_3$; 90% thru 4 mesh	1.35
Cypress, Ill.—90% thru 50 mesh, 50% thru 100 mesh, 90% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh	1.35
Dundas, Ont.—Analysis, 53.8% $CaCO_3$; $MgCO_3$, 43.3%. 50% thru 50 mesh; bags, $4.75; bulk	3.00
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Garnet, Okla.—All sizes	1.25
McCook, Ill.—Analysis, approx. 60% $CaCO_3$, 40% $MgCO_3$; 90% thru 4 mesh	.90
Kansas City, Mo.—50% thru 100 mesh	.75
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% through 10 mesh; 46% through 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$, 32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk	1.60
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 50% thru 50 mesh	1.85@ 2.35
Middlepoint, Bellevue, Kenton, Ohio; Monroe, Mich.; Huntington and Bluffton, Ind.—Analysis, 42% $CaCO_3$, 54% $MgCO_3$; meal, 25 to 45% thru 100 mesh	1.60
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Pixley, Mo.—Analysis, 96% $CaCO_3$; 50% thru 50 mesh	1.25
50% thru 100 mesh; 90% thru 50 mesh; 50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh	1.65
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stone City, Iowa. — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Tulsa, Okla.—Analysis $CaCO_3$, 86.15%, 1.25% $MgCO_3$, all sizes	1.25

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00
Piqua, Ohio, sacks, 4.50@5.00 bulk	3.00@ 3.50
Rocky Point, Va.—80% thru 200 mesh; bags, 4.25@4.75; bulk	3.00@ 3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Berkeley Springs, W.Va.—Glass sand	2.25
Cedarville and S. Vineland, N. J.—Damp	1.75
Dry	2.25
Cheshire, Mass.: 6.00 to 7.00 per ton; bbl.	2.50
Columbus, Ohio	1.00@ 1.50
Estill Springs and Sewanee, Tenn.	1.50
Franklin, Penn.	2.00
Gray Summit and Klondike, Mo.	2.00
Los Angeles, Calif.—Washed	5.00
Mapleton Depot, Penn.	2.00@ 2.25
Massillon, Ohio	3.00
Mineral Ridge and Ohlton, Ohio.	2.50
Oceanside, Calif.	3.00
Ottawa, Ill. (Contracts)	1.00
Pittsburgh, Penn.—Dry	4.00
Damp	3.00
Red Wing, Minn.: Bank run	1.50
Ridgway, Penn.	2.50
Rockwood, Mich.	2.75@ 3.25
Round Top, Md.	2.25
San Francisco, Calif.	4.00@ 5.00
St. Louis, Mo.	2.00
Sewanee, Tenn.	1.50
Thayers, Penn.	2.50
Utica, Ill.	1.00@ 1.25
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.75
Columbus, Ohio	.75@ 1.50	
Eau Claire, Wis.	4.25	*.40@ 1.00
Estill Springs and Sewanee, Tenn.	1.35@ 1.50	1.35@ 1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Ambridge & So. H'g'ts, Penn.	1.25	1.25	1.15	.85	.85	.85
Attica and Franklinville, N. Y.	.75	.75	.85	.75	.75	.75
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	.95			.85	
Erie, Pa.		1.00*		1.50*	1.75*	
Farmingdale, N. J.	.58	.48	.75	1.20	1.10	
Hartford, Conn.	.65*					
Leeds Junction, Me.		.50	1.75		1.35	1.25
Machias Jct., N. Y.		.75	.75		.75	
Montoursville, Penn.	1.00	1.00	.90	.75	.75	.75
Northern New Jersey	.50@ .60	.50@ .60	1.00@1.25	1.00@1.25	1.00@1.25	
Olean, N. Y.		.75	.75		.75	
Shining Point, Penn.			1.00	1.00	1.00	1.00
Somerset, Pa.		1.85@2.00		1.35@1.50		
South Heights, Penn.	1.25	1.25	.85	.85	.85	.85
Washington, D. C.	.85	.85	1.70	1.50	1.30	1.30
CENTRAL:						
Algonquin and Beloit, Wis.	.50	.40	.60	.60	.60	.60
Attica, Ind.			All sizes .75@.85			
Aurora, Oregon, Sheridan, Moronts, Yorkville, Ill.	.40@ .50	.40@ .60	.20@ .50	.50@ .60	.60	.55@ .60
Barton, Wis.		.50		.75	.75	.75
Chicago, Ill.	.70	.60	.50	.60	.60	.60
Columbus, Ohio		.70	.70	.70	.70	
Des Moines, Iowa	.40	.40	1.50	1.50	1.50	1.50
Eau Claire, Wis.	.40	.45	.95	1.00	.95	.95
Elgin, Ill.		.20*	.50*	1.50*	1.50*	1.50*
Elkhart Lake, Wis.	.60	.30	.50	.50	.40	.40
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Ft. Dodge, Iowa	.85	.85	2.05	2.05	2.05	2.05
Ft. Worth, Texas	2.00	2.00	2.00	2.00	2.00	2.00
Grand Haven, Mich.		.50@ .80		.60@ .90		.70@ .90
Grand Rapids, Mich.		.50		.80	.80	.70
Hamilton, Ohio		1.00			1.00	
Hersey, Mich.		.50				.70
Humboldt, Iowa	.40@ .60	.40@ .60	1.40@1.60	1.40@1.60	1.40@1.60	1.40@1.60
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Joliet, Plainfield and Hammond, Ill.	.60	.50	.50	.60	.60	.60
Mason City, Iowa	.50	.50	1.45	1.45	1.45	1.35
Mankato, Minn.		.45	1.25	1.25	1.25	1.25
Mattoon, Ill.	.75	.75	.75	.75	.75	.75
Milwaukee, Wis.		1.01	1.21	1.21	1.21	1.21
Moline, Ill.	.60@ .85	.60@ .85	1.00@1.20	1.00@1.20	1.00@1.20	1.00@1.20
Northern New Jersey	.70	.70			1.60	
Oregon City, Ore.		1.25	1.25	1.25	1.25	1.25
Palestine, Ill.	.75	.75	.75	.75	.75	.75
Silverwood, Ind.	.75	.75	.75	.75	.75	.75
St. Louis, Mo.	1.18	1.45	1.65	1.45	1.65	1.45c
Terre Haute, Ind.	.75	.60	.75	.90	.90	.75
Wolcottville, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.10	1.10
Zanesville, Ohio		.60	.50	.60	.80	
SOUTHERN:						
Charleston, W. Va.		All sand, 1.40.		All gravel, 1.50.		
Chattanooga, Tenn.		1.65			1.45	
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.20
Lindsay, Texas					.55	
Macon, Ga.	.50	.50				
New Martinsville, W. Va.	1.00	.90@1.00		1.20@1.30		.80@ .90
Roseland, La.	.60	.50	1.50	1.10	1.10	
WESTERN:						
Kansas City, Mo.	.80	.70				
Los Angeles, Calif. (points all around) (d)	.60	.50	.85	.85	.85	.85
Los Angeles district (bunkers)†	1.50	1.40	1.85	1.85	1.85	1.85
Phoenix, Ariz.	1.25*	1.00*	2.50*	2.00*	1.75*	1.50*
Pueblo, Colo.	.80	.65		1.35		1.20
San Diego, Calif.	.65@ .75	.65@ .75	1.50	1.30	1.10	1.10
Seattle, Wash. (bunkers)	1.50*	1.50*	1.50*	1.50*	1.50*	1.50*

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			Dust to 3 in., .40			
Chicago, Ill.						.40
Dudley, Ky.	1.10	1.00	.90			
East Hartford, Conn.			Sand, .75*			
Ferrysburg, Mich.						.65@1.00
Gainesville, Texas		.95				.55
Grand Rapids, Mich.				.60		
Hamilton, Ohio					.70	
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Joliet, Plainfield and Hammond, Ill.	.35					
Lindsay, Texas						.55
Macon, Ga.	.35	.35				
Mankato, Minn.			Pit run sand, .70			
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Ottawa, Oregon, Moronts and Yorkville, Ill.			Ave. .60 per ton all sizes			
Roseland, La.					.85	
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Shining Point, Penn.			Concrete sand, 1.10 ton			
Smithville, Texas	.50	.50	.50	.50	.50	.54
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Waukesha, Wis.	.60	.60	.60	.60	.60	.64
Winona, Minn.	.40	.40	.60	.60	.60	.60
York, Penn.	1.10	1.00				

(a) ¾ in. down. (b) River run. (c) 2½ in. and less.
*Cubic yd. †Include freight and bunkerage charges and truck haul. ‡Delivered on job.
(d) Less 10c per ton if paid E.O.M. 10 days. (e) pit run. (f) plus 15c winter loading charge.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Aetna, Ill.				.30@ .35			
Albany, N. Y.	2.25	2.00	2.25			3.50	
Arenzville, Ill.	1.50@1.75			1.00			
Beach City, Ohio	1.75@2.25	1.75@2.25		1.75@2.25	2.00@2.50	2.00@2.50	
Columbus, Ohio	1.50@2.00	1.50@1.75	2.00@2.50	.30@1.50	1.25@2.00	2.75@4.00	1.25@1.50
Eau Claire, Wis.				1.25		3.00	
Elco, Ill.	Ground silica per ton in carloads—18.00@31.00						
Elnora, N. Y.			1.75				
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75		1.75			
Joliet, Ill.	No. 2 molding sand; loam for luting and open hearth work—.65@.85						
Kasota, Minn.							1.00@1.25
Klondike, Mo.	1.75		2.00	1.75	1.75		1.25
Mapleton Depot, Penn.	2.00	2.00	2.00	2.00		2.25	
Massillon, Ohio	2.50	2.50		2.50	2.50		
Michigan City, Ind.				.30@ .35			
Mineral Ridge and Ohlton, Ohio	1.75*	1.75*		2.00*	1.75*	2.00*	1.75*
Montoursville, P'n.				1.25@1.35			
New Lexington, O.	1.75	1.25					
Ottawa, Ill.		.75@1.00†					
Red Wing, Minn.	1.25		1.25	1.50	1.50	3.50	1.50
Ridgeway, Penn.	1.50	1.50					
Round Top, Md.				1.60			
San Francisco, Calif.	3.50	4.75	3.50	3.50@5.00	3.50@4.50	3.50@5.00	
Tamalco, Ill.		1.40@1.60					
Tamms, Ill.	Ground silica per ton in carloads—20.00@31.00						
Thayers, Penn.	1.25	1.25		2.00			
Utica, Ill.	1.00@1.25	.50@ .75¶	1.00@1.25	.55@1.25§	.55@1.25§	2.85@3.25	1.00@1.25
Utica, Penn.	1.75	1.75		2.00			
Warwick, Ohio	1.75*@2.25	1.75*		1.75*@2.25			
Zanesville, Ohio	1.75	1.25@1.50	1.75				

*Green. †Crude silica, crushed and screened, not washed or dried. ‡Plus 75c per ton for winter loading. ¶Crude. §Crude and dry.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Emporium nd Dubois, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Eastern Penn. and Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Pa.	2.50	1.00		1.25			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.45*	1.80*	1.45*	1.45*	1.45*	1.45*
Jackson, Ohio		1.05*		1.30*	1.05*	1.30*	1.30*
Toledo, Ohio	1.50	1.25	1.50	1.25	1.25	1.25	1.25
Youngst'n, O., dist.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.		1.55*		1.55*	1.55*	1.55*	1.55*
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruessens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15
Woodward and East Birmingham, Ala.	2.05	.75		1.25	.90@1.05	.90	

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.20
Buffalo, N. Y.		12.00	12.00	12.00			10.00	1.95d
Chazy, N. Y.	12.50	10.50	8.00	12.00	11.50	16.50	10.00	2.50₂
Lime Ridge, Penn.							5.00a	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00t
Williamsport, Penn.			10.00				6.00	
York, Penn.		9.50	9.50	10.50			8.50	1.65i
CENTRAL:								
Afton, Mich.					8.50	1.61		
Carey, Ohio	12.50	8.50@9.50	9.50		9.50		9.00	
Cold Springs, Ohio	12.50	8.50	8.50		9.00		8.00	
Delaware, Ohio	12.50	10.00	9.00	10.00			9.00	1.50
Frederick, Md.		10.00	9.50	10.00			7.50	1.45
Gibsonburg, Ohio	12.50							
Huntington, Ind.	12.50	8.50	8.50		9.00		8.00	
Luckey, Ohio (f)	12.50							
Marblehead, Ohio		8.50	8.50		9.00		8.00	1.50w
Marion, Ohio		8.50	.850				8.00	1.70d
Milltown, Ind.		9.00@10.00		10.00p	8.00₈			1.40r
Sheboygan, Wis.	11.50						9.50	.95
Tiffin, Ohio					9.00			
White Rock, Ohio	12.50				9.00	11.00	8.00	
Wisconsin points (f)		11.50					9.50	
Woodville, Ohio	12.50	8.00	8.00	13.50	9.00	11.00	9.00	1.50
SOUTHERN:								
Allgood, Ala.	12.50	10.00			8.50		8.50	1.50
El Paso, Tex.							14.00	1.75
Graystone, Ala.	12.50	10.00		12.50			8.50	1.50
Keystone, Ala.	12.00	10.00	10.00	10.00	9.00		8.50	1.50u
Knoxville, Tenn.	20.25	10.00		10.00			8.50	1.50
Ocala, Fla.		13.00	10.00			.80	12.00	1.70
WESTERN:								
Calcite, Colo.							9.25	
Kirtland, N. M.							15.00	
Limestone, Wash.	15.00	15.00	10.00	15.00	16.50	16.50	16.50	2.09
Dittlinger, Tex.		12.00@13.00					9.50p	1.50₄
San Francisco, Calif.	19.50@21.00	18.00@20.00	15.00	18.50			14.00₅	2.00
Tehachapi, Calif.			8.00				13.00z	2.20x
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

†50-lb. paper bags; (a) run of kilns; (c) wooden, steel 1.70; (d) steel; (e) per 180-lb. barrel; (f) dealers' prices; (g) to 9.50; (h) to 1.75; (i) 180-lb. net barrel 1.65; 280-lb. net barrel, 2.65 (m) finishing lime, 3.00 common; (n) common lime; (o) high calcium; (p) to 10.50; (q) to 8.50; (r) to 1.50; (s) in 80-lb. burlap sacks; (t) to 3.00; (u) two 90-lb. bags; (v) oil burnt; wood burnt 2.25@2.50; (x) wood, steel 2.30; (z) to 15.00; (*) quoted f.o.b. New York; (‡) paper bags; (w) to 1.50 in two 90-lb. bags, wood bbl. 1.60; (¶) to 10.00; (1) 80-lb. paper bags; (2) to 3.00; (3) to 9.00; (4) to 1.60. (5) to 16.00.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Gray Summit and Klondike, Mo.		1.75
Mapleton Depot, Penn.	2.00	2.00
Massillon, Ohio		2.25
Mineral Ridge and Ohlton, Ohio	*1.75	*1.75
Montoursville, Penn.		1.25
Ottawa, Ill.	1.25@ 1.50	
Red Wing, Minn.		1.25
Round Top, Md.	2.25	1.75
San Francisco, Calif.	3.50@ 4.50	3.50@ 4.50
Thayers, Penn.		2.25
Utica, Ill.	1.00@ 1.25	1.00
Warwick, Ohio		2.25
Zanesville, Ohio		2.50

*Wet.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel worker's crayons, per gross	.08 1.25
Chatsworth, Ga.:	
Crude Talc	5.00
Ground (150-200 mesh), bulk	12.00
Pencils and steel worker's crayons, per gross	1.00@ 2.50
Chester, Vt.:	
Ground talc (150-200 mesh), bulk	9.00@10.00
Including bags	10.00@11.00
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Dalton, Ga.:	
Crude talc	5.00
Ground talc (150-200) bags	10.00@12.00
Pencils and steel workers' crayons, per gross	1.00@ 1.50
Emeryville, N. Y.:	
(Double air floated) including bags;	
325 mesh	14.75
200 mesh	13.75
Hailesboro, N. Y.:	
Ground white talc (double and triple air floated) including bags, 300-350 mesh	15.50@20.00
Henry, Va.:	
Crude (mine run)	3.50@ 4.50
Ground talc (150-200 mesh), bulk	7.50@14.00
Joliet, Ill.:	
Roofing talc, bags	12.00
Ground talc (200 mesh), bags	30.00
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00@30.00
Natural Bridge, N. Y.:	
Ground talc (300 mesh), bags	13.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn.—B.P.L. 65-70%	4.50@ 5.00
Mt. Pleasant, Tenn.—B.P.L. 75%	6.00
Tennessee—F.O.B. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	7.25@ 8.25

Ground Rock

(2000 lbs.)

Centerville, Tenn.—B.P.L. 65%	7.00
Gordonsburg, Tenn.—B.P.L. 65-70%	4.00@ 4.50
Mt. Pleasant, Tenn.	5.00@ 5.75
Twomey, Tenn.—B.P.L. 65%	7.25

Florida Phosphate

(Raw Land Pebble)

(Per Ton.)

Florida—F. O. B. mines, gross ton,	
68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75
72% min. B.P.L., Basis 72%	4.25
75/74% B.P.L., Basis 75%	5.25
77/76% B.P.L., Basis 77%	6.25

Mica

Prices given are net, F.O.B. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton	125.00@150.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	19.00@ 20.00
Rumney Depot, N. H. — per ton, mine run	360.00
Mine scrap	24.00
Clean shop scrap	27.00
Dry ground, 20 mesh	28.00
40 mesh	35.00
60 mesh	40.00
100 mesh	60.00
200 mesh	80.00
Roofing mica	27.00
Punch mica, per lb.	.10

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Barton, Wis., f.o.b. cars		10.50
Brandon, Vt.—English pink and English cream	*11.00	*11.00
Brandon grey	*11.00	*11.00
Buckingham, Que.—Buff stucco dash		‡12.00@14.00
Chicago, Ill. — Stucco chips, in sacks f.o.b. quarries		17.50
Crown Point, N. Y.—Mica Spar		8.00@10.00
Easton, Penn.—Green, bags included	10.00@20.00	10.00@20.00
Haddam, Conn. — Felstone buff	15.00	15.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio — Concrete facings and stucco dash		6.00@18.00
Middlebrook, Mo.—Red		25.00@30.00
Middlebury and Brandon, Vt.—Middlebury white		‡9.00
Milwaukee, Wis.		14.00@34.00
Newark, N. J.—Roofing granules		7.50
New York, N. Y.—Red and yellow Verona		32.00
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Stockton, Calif. — "Natrock" roofing grits		15.00@20.00
Tuckahoe, N. Y.		12.00
Villa Grove, Colo.		13.00
Warren, N. H.—cement facing (mica), per ton		7.50
Wauwatosa, Wis.		16.00@45.00
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00

†C.L.
*C.L. including bags; L.C.L. 12.50.
‡C.L. including bags, L.C.L. 10.00.

Potash Feldspar

Auburn and Brunswick, Me.—Color, white; 98% thru 140 mesh bulk	19.00
Bath, Me.—Color, white; analysis, potash, 12%; 100% thru 180 mesh, bags, 21.00; bulk	18.00
Buckingham, Que.—Color, white; analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white; bulk (crude)	9.00
East Hartford, Conn.—Color, white, 95% through 60 mesh, bags	16.00
96% thru 150 mesh, bags	23.00
Erwin, Tenn.—Color, white; analysis, 12.07% K_2O, 19.34% Al_2O_3; Na_2O, 2.92%; SiO_2, 64.76%; Fe_2O_3, .36%; 98.50% thru 200 mesh, bags, 16.90; bulk	15.50
Glen Tay Station, Ont., color, red or punk; analysis: K_2O, 12.81%, crude (bulk)	6.00@ 7.50
Keystone, S. D.—Prime white, bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 10 35%; Na_2O, 3.62%; Al_2O_3, 18.71%; SiO_2, 65.48%; Fe_2O_3, .17%; 99% thru 200 mesh, bags included, carloads	22.00
Bulk	20.00
Murphysboro, Ill.—Color, snow white; analysis SiO_2, 64.4%; K_2O, 13%; Na_2O, 2.5%; Fe_2O_3, 0.07%; Al_2O_3, 19.3%; 98% thru 200 mesh, bags	21.00
Bulk	20.00
Penland, N. C.—Color, white; crude, bulk	8.00
Ground, bulk	16.50
Tenn. Mills—Color, white; analysis K_2O, 18%; Na_2O_3, 10%; 65% SiO_2; 99% thru 200 mesh; bulk	18.00
99% thru 140 mesh, bulk	16.00
Toughkenamon, Pa.—Color, white to light cream; 98% thru 150 mesh, bags, 11.00@13.00; bulk	10.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00
Trenton, N. J.—Crude, bulk	12.00@27.00
99% thru 140 mesh; bulk	16.00
(Bags 11 cents each, non-returnable)	
Wheeling, W. Va.—Color, white; analysis, K_2O, 9.50%; Al_2O_3, 16.70%; Na_2O, 3.50%; SiO_2, 69.50%; 99% thru 140 mesh, bulk	19.00

Blended Feldspar
(Pulverized)

Tenn. Mills—Bulk 16.00@20.00

Chicken Grits

Afton Mich. (limestone) per ton	10.00
Belfast and Rockland, Me.—(Limestone), bags, per ton	‡10.00
Brandon and Middlebury, Vt., per ton	12.00‡
Centerville, Iowa (gypsum) per ton	18.00
Chico, Texas (limestone), 100 lb. bags, per ton	8.00@ 9.00
Los Angeles Harbor (limestone), 100-lb. sack, 1.00; sacks, per ton, 8.50@9.50†; bulk, per ton	6.00@7.00†
Toughkenamon, Pa.—(Feldspar) 100-lb. bags, 1.00; bulk, per ton	10.00
Gypsum, Ohio.—(Gypsum) per ton	10.00
Limestone, Wash. (limestone) per ton	12.50
Rocky Point, Va. (limestone) 100 lb. bags, 75c; sacks, per ton, 6.00 bulk	5.00
Seattle, Wash.—(Limestone), bulk, per ton	12.50
Warren, N. H.—(Mica) per ton	7.80
Waukesha, Wis.—(Limestone), per ton	8.00
West Stockbridge, Mass.—(Limestone) bulk	7.50@9.00*

*L.C.L.
†Less than 5-ton lots.
‡C.L.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	10.50
Boston, Mass.	*17.00
Brighton, N. Y.	*19.75
Dayton, Ohio	12.50@13.50
Detroit, Mich.	‡17.50
Farmington, Conn.	17.00
Flint, Mich.	¶12.50@16.00
Grand Rapids, Mich.	12.00
Hartford, Conn.	*20.00
Jackson, Mich.	13.00
Lancaster, N. Y.	13.00
Madison, Wis.	†a14.00
Michigan City, Ind.	12.00
Milwaukee, Wis.	*13.00
Minneapolis and St. Paul, Minn.	11.25
New Brighton, Minn.	10.00
Pontiac, Mich.	11.00@12.00
Portage, Wis.	15.00
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	13.00
Sebewaing, Mich.	12.00
Syracuse, N. Y.	18.00
Toronto, Canada	13.00
Wilkinson, Fla.-White	12.00

*Delivered on job. †Delivered in city limits.
‡Less 5%. ¶Dealers' price. (a) Less 1.00 E.O. M. 10 days.

Portland Cement

Prices per bag and per bbl, without bags net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.		3.47
Atlanta, Ga.		2.35
Baltimore, Md.		1.70@2.35
Birmingham, Ala.		2.30
Boston, Mass.		1.81@2.63‡
Buffalo, N. Y.		1.67@2.38‡
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa		2.34
Charleston, S. C.		2.35
Cheyenne, Wyo.	.82¼	3.31
Cincinnati, Ohio		2.37
Cleveland, Ohio		2.29
Chicago, Ill.		2.20‡
Columbus, Ohio		2.34
Dallas, Texas		2.10
Davenport, Iowa		2.29
Dayton, Ohio		2.38
Denver, Colo.	.66¼	2.65
Detroit, Mich.		2.15‡
Duluth, Minn.		2.09
Houston, Texas		2.60
Indianapolis, Ind.		2.29
Jackson, Miss.		2.60
Jacksonville, Fla.		2.35
Jersey City, N. J.		1.85@2.33
Kansas City, Mo.		2.02‡
Los Angeles, Calif.	.61†	2.44†
Louisville, Ky.		2.27
Memphis, Tenn.		2.60‡
Milwaukee, Wis.		2.25
Minneapolis, Minn.		2.32‡
Montreal, Que.		1.90
New Orleans, La.		2.20
New York, N. Y.		1.77@2.25‡
Norfolk, Va.		2.17
Oklahoma City, Okla.		2.46‡
Omaha, Neb.		2.36‡
Peoria, Ill.		2.27
Philadelphia, Penn.		1.85@2.41‡
Phoenix, Ariz.		3.70
Pittsburgh, Penn.		2.09
Portland, Colo.		2.80
Portland, Ore.		2.90
Reno, Nevada	.75¼	3.01
Richmond, Va.		1.69@2.44
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.		2.31‡
Savannah, Ga.		2.50
St. Louis, Mo.	.55	2.20‡
St. Paul, Minn.		2.32
Seattle, Wash.	10c discount	2.65
Tampa, Fla.		2.60
Toledo, Ohio		2.20
Topeka, Kans.		2.41‡
Tulsa, Okla.		2.33‡
Wheeling, W. Va.		2.17
Winston-Salem, N. C.		2.78

NOTE—Add 40c per bbl. for bags.
†Delivered on job in any quantity, sacks extra.
‡Ten cents less to dealers.

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.
Buffington, Ind.		1.85
Chattanooga, Tenn.		2.45*
Concrete, Wash.		2.35
Davenport, Calif.		2.05
Detroit, Mich.		2.15
Hannibal, Mo.		2.05
Hudson, N. Y.		2.05
Leeds, Ala.		1.95
Mildred, Kans.		2.35
Nazareth, Penn.		1.95
Northampton, Penn.		1.95
Richard City, Tenn.		2.05
Steelton, Minn.		1.90
Toledo, Ohio		2.20
Universal, Penn.		1.85

*Including sacks at 10c each.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	White Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	—Plaster Board— ⅜x32x 36". Wt. 1500 lb. Per M Sq. Ft.	—Plaster Board— ⅜x32x 36". Wt. 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lgths. 6'-10', 1850 lb. Per M Sq. Ft.
Arden, Nev. and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	.....	.....	.....	.....	11.70u	.....	.....	.....
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	.....	.....	13.50	.....	.....	.....
Detroit, Mich.‡	.....	.....	.....	11.30	11.30	11.30	.....	8.00	.....	.....	.....	.....	.....
Delawanna, N. J.	.....	.....	.....	.....	.....	8.00	8.25@9.40	.....	.....	.....	.14½s	.15½s	40.00@41.00
Douglas, Ariz.	.....	.....	7.00	.....	.....	15.50d	18.50	.....	30.00	15.50	.....	.....	.....
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50	.....	24.55	20.00	.....	.....	.....
Gypsum, Ohio‡	3.00	4.00	6.00	9.00	9.00	9.00	19.00	7.00	27.00	20.00	.....	15.00	30.00
Hanover, Mont.	.....	.....	.....	11.80	.....	.....	.....	.....	.....	.....	.....	.....	.....
Los Angeles, Calif.	.....	.....	10.40	10.40k	.....	.....	.....	.....	.....	.....	.....	.....	.....
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	.....	20.00	30.00
Portland, Colo.	.....	.....	.....	10.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	.....	13.40r	14.40r	.....	15.40r	.....	.....	.....	.....	.....	.....
Seattle, Wash.	6.50	.....	11.00	16.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sigurd, Utah	.....	.....	.....	.....	.....	.....	.....	.....	21.50	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
*To 3.00; †to 11.00; ‖to 12.00; ‡prices per net ton, sacks extra; (a) to 25.00; (b) net; (c) gross; (d) hair fibre; (f) delivered; (h) delivered in six states; (i) delivered on job; (k) sacks 12c extra, rebated; (m) includes paper bags; (o) includes jute sacks; (r) including sacks at 15c; (s) per board; (t) to 16.50; (u) includes sacks; (v) F.O.B. N. Y. C. and dealers yard in mill locality.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City of shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00		
Columbus, Ohio	.16@.18a		
Detroit, Mich.	19.00‡		28.00‡
Forest Park, Ill.	18.00*	23.00*	30.00*
Grand Rapids, Mich.	.16		
Graettinger, Iowa	.18@.20		
Indianapolis, Ind.	.14@.16†		
Los Angeles, Calif.¶	5¾x3½x12—55.00	7¾x3½x12—65.00	
Oak Park, Ill.	.18@.21a		
Olivia and Mankato, Minn.	9.50b		
Somerset, Pa.	.20@.22		
Yakima, Wash.	20.00*		

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton.

Cement Roofing Tile

Prices are net per sq. in carload lots, f.o.b. nearest shipping point unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.

Red	15.00
Green	18.00
Chicago, Ill.—per sq.	20.00

Cicero, Ill.—Hawthorne roofing tile, per sq.

	Chocolate Red and Orange	Green and Blue	Yellow, Tan and Slate Gray
French and Spanish†	$11.50	$13.50	$12.75
Ridges (each)	.25	.35	.30
Hips	.25	.35	.30
Hip starters	.50	.60	.60
Hip terminals, 2-way	1.25	1.50	1.50
Hip terminals, 4-way	4.00	5.00	5.00
Mansard terminals	2.50	3.00	3.00
Gable finials	1.25	1.50	1.50
Gable starters	.25	.35	.30
Gable finishers	.25	.35	.30
*End bands	.25	.35	.30
*Eave closers	.06	.08	.06
*Ridge closers	.05	.06	.05

*Used only with Spanish tile.
†Price per square.

Houston, Texas.—Roofing Tile, per sq.	
Red	17.00
Green	19.50
Indianapolis, Ind.—9"x15"	
Gray	10.00
Red	11.00
Green	13.00
Waco, Texas:	Per sq.
4x4	.60
4x8x12	65.00
Mt. Pleasant, N. Y.:	Per 1000
5x8x12	78.00
Grand Rapids, Mich.:	Per 1000
5x8x12	70.00
Houston, Texas:	
5x4x12 (Lightweight)	45.00
5x8x12 (Lightweight)	80.00
Pasadena, Calif.—(Stone Tile	Per 100
3½x4x12	3.00
3½x6x12	5.00
3½x8x12	6.00
Wildasin Spur, (Building Tile) Los Angeles, Calif.:	Each
4x3½x12	.03½
6x3½12	.04½
8x3½x12	.05½
Yakima, Wash.—Building tile:	
5x8x12	.10

Cement Building Tile

Cement City, Mich.—5"x8"x12", per M	55.00
Detroit, Mich.—5x8x12, per 100	8.50
Longview, Wash.—(Stone Tile)	Per 1000
4x6x12	55.00

Cement Drain Tile

Graettinger, Iowa drain tile per 100 ft.	
5-in.	4.50
6-in.	5.60
8-in.	9.00
10-in.	12.00
12-in.	17.50
14-in.	25.00
16-in.	35.00
18-in.	45.00
20-in.	60.00
22-in.	70.00
24-in.	80.00
30-in.	100.00
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile per ft.:	
3 in.	.04
4 in.	.05
6 in.	.07½
8 in.	.10
Waukesha, Wis.—Drain tile, per ton	9.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@35.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Friesland, Wis.	22.00	32.00
Longview, Wash.	20.00	
Milwaukee, Wis	15.00	30.00@50.00
Mt. Pleasant, N. Y.		14.00@23.00
Omaha, Neb.	18.00	30.00@40.00
Pasadena, Calif.	12.50	
Philadelphia, Penn.	†15.25	‡21.50
Portland, Ore.	17.00	25.00@75.00
Prairie du Chien, Wis.	14.00	22.50
Rapid City, S. D.	18.00	25.00@40.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Wauwatosa, Wis.	14.00	20.00@42.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	

†Gray. ‡Red.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted.

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								$14.00 per ton									
Graettinger, Iowa	.04½d	.05½	.08½	.12½	.17½	.....	.40	.50	.60	.70	.....	.....	.....	.....	.....	.....	.....
G'd Rapids, Mich. (b)	.....	.....	.....	.60	.72	1.00	1.28	.....	.....	1.92	2.32	3.00	4.00	5.00	6.00	.....	.....
Houston, Texas	.....	.19	.24	.43	.55½	.90	1.30	.....	†1.70	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.80	.90	1.10	1.30	.....	.....	1.70	.....	2.70	.....	.....	.....	.....	.....
Longview, Wash.								Sewer pipe 40% off list, culvert—list									
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Olivia & Mankato, Minn.												12.00 per ton					
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Pa.	.....	.....	.....	.....	80[1]	1.00[2]	1.40[3]	.....	.....	2.00[4]	.....	3.25[5]	4.00[6]	6.00[7]	.....	.....	.....
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tiskilwa, Ill. (rein.) (a)	.....	.....	.....	.65	.75	.85	1.10	1.60	.....	1.90	.....	.....	3.40	.....	.....	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78
Waukesha, Wis.								12 in. to 60 in. 18.00 per ton									
Yakima, Wash.								$10.00 per ton									

*30-in. lengths up to 27-in. diam., 48-in. lengths after; (a) 24-in. lengths; (b) Reinforced; (c) Interlocking bar reinforced.
†21-in. diam. ‡Price per 2 ft. length. (d) 5 in. diam. [1]@1.08 [2]@1.25. [3]@1.65. [4]@2.50. [5]@3.85. [6]@5.00. [7]@7.50.

Kennedy Cement Products Plant About Completed

CONSTRUCTION of the new cement products plant of the Kennedy Brick and Tile Co. at Avon Park, Fla., is about completed and is expected to be in operation within a short time, according to J. H. Herman, general manager.

The main building is two stories, 100x170 ft. Running from the curing rooms will be cement runways which will facilitate the transfer from curing rooms to yards of the brick and tile, while alongside one runway will be the sidetrack tapping both railroads, which will permit loading cars direct from curing rooms.

Work already has begun on a ditch running to Lake Glenada through which surplus water from sand pumping will be carried back to the rear of the lake. The plan includes digging of a lake or sand pond adjoining the plant. A dredge in Lake Glenada will pump in the white sand from the lake bottom to this sand pond. The surplus water will drain back to the lake and an automatic chain conveyor will pick up the sand and carry it to the mixing bins on the second floor.

The plant will have a capacity of 25,000 brick per day in addition to building and roofing tile. A face brick with fancy fronts will be one of the products.—*Tampa (Fla.) Tribune.*

Largest Cement Products Plant in Kentucky to Start Operation

THE new cement products plant of the Jackson Concrete Products Co. at Louisville, Ky., is expected to start operations within a short time. It is said to be the largest in the state and will have a capacity of 35,000 concrete brick, 7500 hollow tile and about 1000 regular cement blocks daily. In addition to this various ornamental cement products and pre-cast stone will be made.

The company has obtained the exclusive territorial rights for the Phillips continuous tile machine from the Phillips Co., Standford, Ky. This machine will be one of the units used at the new plant.

All the officers of the company are identified with building interests in central Kentucky. The company is capitalized for $50,000 and Hughes Jackson is president.

Geological Survey Studying the Age of Minerals and Rocks

DURING the last two decades increased knowledge of the phenomena of radioactivity, conjoined with analyses of minerals, has brought to the front a new measuring stick for determining the age of minerals and rocks. The work by this new method is little more than begun, but enough has been accomplished to indicate the age of the globe as computable in hundreds of millions of years, rather than in tens of millions, as has often been heretofore assumed. Somewhat as the hardening of the bones indicate the age of a human being, so the accumulation of helium and lead in uranium and thorium minerals indicates their age, but on a scale whose units are millions of years. The criterion is based on the fact that helium and lead are the end products of the radioactive decay of the elements uranium and thorium, and the age of the rock is computed from the rate of such decay and the quantities of these substances the rock contains.

Time relations have always been of major interest in geology. Both practical and theoretical geologists need to know in the study of rocks and minerals which were formed earlier and which were later. The mere observation of relative position was for a long time the only guide; then came correlation by means of fossils of extinct animals, and finally attempts have been made to estimate the length of time required to deposit the sedimentary strata or to cut gorges, or the time required for sediments to shrink, for the earth to cool and the like; and some of these estimates have even led to speculations concerning the age of the earth itself.

The chemical laboratory of the Geological Survey, Department of the Interior, has furnished many of the analyses by which the age of minerals and rocks may be computed from their content of helium and lead. The making of analyses useful for this purpose is a complex process. Hillebrand early set the standard; and even he, in his extended work on uraninites, failed to discover that part of the "nitrogen" gas he measured was helium. In the popular conception an analysis of a mineral or a rock is perhaps a simple and quick operation like an assay for gold; but a mineral analysis may consume weeks of time and study—in fact, the combinations of elements in the rarer minerals are so variable that their complete analysis may require months. Few standard methods of procedure are available as guides. For the purpose of determining the age of minerals, however, only the percentages of uranium, thorium, helium and lead seem to be absolutely necessary at present, and when more experience has been gained in their estimation the time required for the analytical work may be shortened considerably. The minerals to be analyzed for age determinations must be carefully selected with regard to their freshness and geologic sequence, if that can be established.

This method of determining the age of minerals and rocks has been studied rather extensively abroad, particularly in England and Austria. In this country the problem has recently been taken up under the auspices of the National Research Council through co-operation of a number of scientists and various institutions, including the Geological Survey, the Geophysical Laboratory, Harvard University and other agencies. A table of minerals, showing their geologic horizons and their age computed by this method, has been prepared for the International Critical Tables of Constants, which are being published under the auspices of the National Academy of Sciences and the National Research Council.

How to Avoid Explosions of Pulverized Coal

NUMEROUS suggestions for handling pulverized coal so as to avoid explosions have recently been published by the Bureau of Mines.

These recommendations cover also the installation of the equipment in plants where pulverized coal is used, and will be found of value to all users of this type of fuel.

This information is now printed in bulletin form (No. 242) and is available for distribution, and from which the following recommendations are taken:

There should be absolute cleanliness and freedom from any accumulations of dust, both in the pulverizing plant and in the buildings in which the pulverized coal is used as fuel.

Accumulations of dust on the floor or machinery should never be brushed or swept up without either the dust being wetted or thoroughly mixed with an excess mixture of fine incombustible material.

All coal-pulverizing plants should be adequately ventilated and lighted, and when practicable some method of cleaning by vacuum system should be installed.

All open lights in and around coal-pulverizing plants should be prohibited, and employes should not be allowed to smoke while in the building. This rule should apply to superintendents and other officials who casually visit the plant, as well as to the regular attendants.

The drier and drier furnace should be separated by a fireproof partition from the pulverizing mills, conveying machinery and storage bins.

Where furnaces and boilers are equipped with individual fuel bins, these bins, if possible, should be isolated from the boilers or furnaces.

All pulverized-coal bins should be tightly closed, and never opened if there is any possibility of ignition from an open flame. Bins should be equipped with automatic indicators to indicate the amount of coal in the bin.

Only men of known reliability should be intrusted with the direct operation of a drier. It may be more economical in the long run to pay a higher wage to a careful man than a smaller wage to an unreliable man or boy.

Especial care should be taken not to overheat the coal in the drier, and recording pyrometers should be installed to enable the officials of the plant to check the operation of the drier.

The operation of the drier should never be stopped while it contains a charge of coal.

Fire in the drier furnace should never be started with paper, shavings or any light combustible material.

Because of the liability of spontaneous combustion, dried or pulverized coal at a temperature over 150 deg. F. should never be stored in a bin over 18 hours. For the coal should never be placed in close proximity to furnaces, boilers, steam pipes or flues.

If fire is discovered in a fuel bin, the bin should be tightly sealed and the fire allowed to die for want of oxygen. Fresh coal should not be discharged into a bin in which there is burning coal.

In opening a bin which has been sealed to extinguish a fire, care should be taken not to ignite any inflammable gas which may have been generated during the time the bin was sealed.

Whenever a plant is to be shut down for a few days all store bins should, if possible, be emptied of coal. When it is not possible to empty the bins they should be thoroughly inspected for hot coal before the plant is again put in operation.

In the circulating system of using pulverized coal the primary air pressure should always be maintained at a pressure much higher than that of the secondary air.

If a coal-circulating line becomes plugged the furnaces should be immediately cut out and the secondary air stopped.

After the line has been cleaned it is essential that no smoldering particles of coal are left in the line, and before the fan is started a thorough examination of the line should be made.

Burners should be frequently inspected, and any coke burned thereon should be removed.

Circulating lines should be blown clean of coal when the plant is shut down at the end of the day's work.

The mixture of air and coal in the furnace should never be ignited by a man reaching in or by opening the doors.

All conveyers and elevators should be tightly inclosed and should never be opened while running; before they are opened the machinery should be stopped and the dust allowed to settle.

Whenever pulverized coal becomes caked in bins, transport lines or conveyers it should not be jarred off by hammering, because of the liability of causing leaking joints.

A coal-line compressed-air tank, or storage bin should never be opened in the vicinity of a flame or open light.

All electric wires and cables should, as far as possible, be inclosed in conduits, preferably rigid iron conduits.

All switches should be placed outside the pulverizing plant or in dustproof casings.

Nonsparking motors or motors in dustproof housings should be used in the pulverizing plant.

Precaution should be taken against sparks from static electricity in all rapidly moving machinery by having it thoroughly grounded.

Dust should never be allowed to accumulate upon electric-light bulbs, and the bulbs of all portable lights should be protected by heavy wire guards. Care should be taken to prevent arcing from loose socket connections or imperfectly insulated cords.

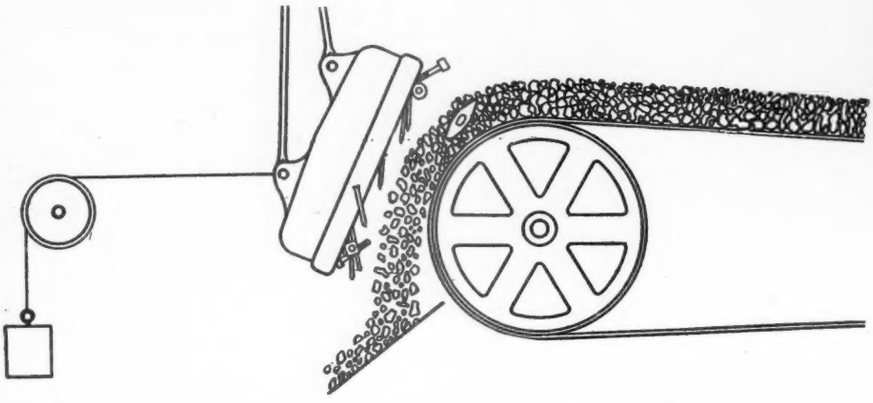
All leaks in pulverized-coal circulating lines or storage bins should be stopped as quickly as leaks in gas lines.

All the men should be educated to the dangers of pulverized-coal dust.

New Machinery and Equipment

Separator Magnets for Removal of Tramp Iron from Raw Materials

FOR the removal of tramp iron from raw materials before entering crushers, the Electric Controller and Manufacturing Co., Cleveland, Ohio, has put out a mushroom type magnetic separator. This separator may be placed in position dictated by the character of the material it is working with, the depth of stream and speed at which it is moving. A method of placing this type of magnetic separator which is said to be used in an Idaho mining district is shown in the accompanying illustration. The magnet is suspended at an angle over the head pulley where the stream of material is just leaving the conveyor belt. It is said that because of the loosened condition of the material at this point (just where it starts to fall from the belt), any pieces of iron which may have been under lumps of material are now freed and can be collected by the magnet, whose face is tangent to the material flow. By leaving the magnet free to swing away in case a large lump of material comes between it and the belt, better results are obtained.



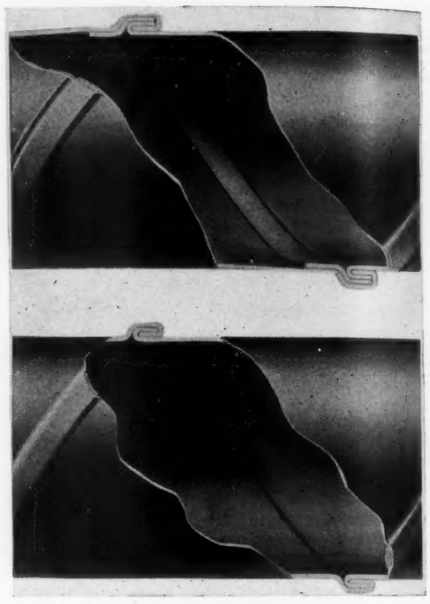
Mushroom type magnetic separator for removal of tramp iron from conveyor belt

The separator magnets are operated on direct current and in cases where this is not available, small motor generator sets may be installed from which several separators may work. The ribbed construction of the magnet case is said to insure rapid radiation of the heat generated in the magnet windings and make water cooling unnecessary. The magnetic flux is said also to be concentrated at the bottom of the magnet giving a high efficiency of separating power. It is claimed that because there are no moving or rotating parts, sliding contacts or collector rings the E. C. & M. separator requires no attention after installation.

Spiral Rivetless Pipe

A COMBINATION of economy and light weight with strength and wearing qualities is claimed for the Naylor spiral lock-seam pipe, manufactured by the Naylor Spiral Pipe Co., Chicago, Ill. The pipe is made by winding sheet steel upon an arbor under very high tension and interlocking the edges at the same time into a 4-ply seam.

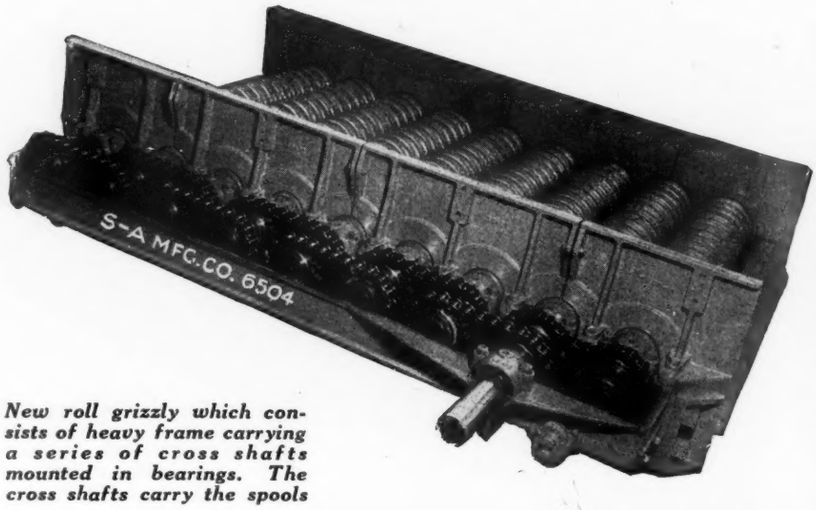
The pipe is formed in a continuous piece and then cut to any desired lengths up to 40 ft. It is made of No. 16 to No. 10 gage sheets from 4 in. to 30 in. in diameter and either plain, galvanized, painted or asphalted. The smooth inside of the pipe interior is said to reduce friction and thus cut down the required driving power for material conveyance. In the rock products industries, the pipe can be used for carrying water to the washing plants, conveying materials, etc. For handling abrasive materials, the pipe is made with a high carbon wearing strip folded into the seam.



Above—Spiral pipe with wearing strip for handling abrasive material. Below —Type of spiral pipe for conveying air, gas and non-abrasives

New Roll Grizzly

A NEW roll grizzly, said to be non-clogging, has been developed by the Stephens-Adamson Manufacturing Co., Aurora, Ill. The S-A "Live Roll" grizzly, as it is known, consists of a heavy rigid frame which carries a series of cross shafts mounted in bearings. Each successive shaft is connected with sprocket chains and is driven from a main operating shaft. The cross shafts carry the spools which are cast to provide the required opening to facilitate the proper separation. The adjacent spool



New roll grizzly which consists of heavy frame carrying a series of cross shafts mounted in bearings. The cross shafts carry the spools

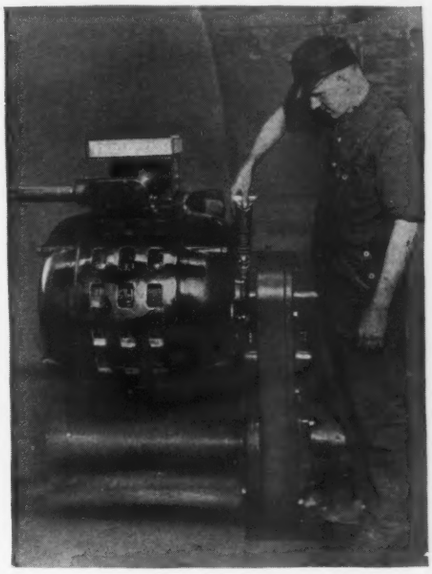
grooves match in such a manner that the opening is round and this, it is claimed, will pass only that material which is under size. Each successive spool is operating at an increased speed so that there is said to be no opportunity for any of the material to wedge in the openings and there is always a tendency for the oversize to be carried over on the periphery of the faster spool.

This machine is built in various sizes and with openings to suit the requirements, providing the openings are not less than 1½ nor more than 3½ in. in diameter. The equipment is a self-contained machine. The driving mechanism is fully enclosed and the skirt plates are attached rigidly to the frame. A mechanically driven oil pump provides circulation of the lubricant, requiring very little attention from the operator.

Grease-Tube Method for Motor Lubrication

A NEW method of lubricating motors has been introduced by the Fairbanks, Morse Co., Chicago, Ill. It is in furnishing different greases in collapsible tubes, each said to contain sufficient grease for a motor's annual requirements. After flushing out the old grease with kerosene as directed in printed instructions supplied with the tube, the new grease is squeezed from the grease tube directly into the bearing. The directions show just how much to put into each bearing. Four sizes of tubes are available for corresponding sizes of bearings.

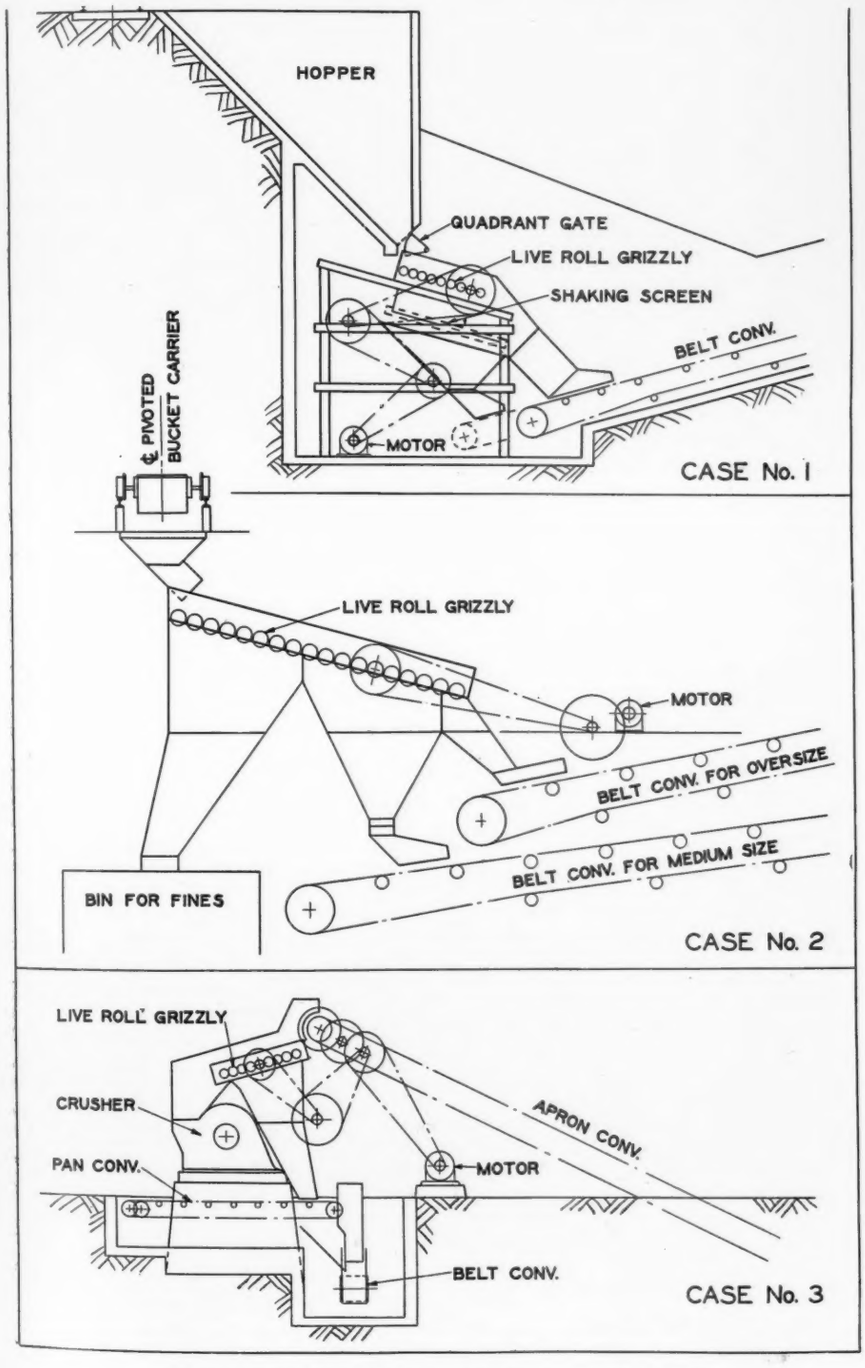
The makers claim that the advantages in this tube method of greasing are that the type of grease best adapted for ball-bearing is used, no dirt or other deleterious matter



Using the grease tube on a motor bearing

can be introduced into the bearing, for the cap of the housing is not removed, only the plug; no grease is wasted or smeared outside of the housing and no wiping is needed and the right amount of grease required for lubrication is used in each bearing.

The tube method of lubrication, it is said, costs no more than the ordinary method, for the cost of the individual container tubes is offset by the elimination of waste.



Three typical installations with the new roll grizzly

Stronger Body Joints for Motor Trucks

SINCE the beginning of the automotive industry Pierce-Arrow has been one of the leaders in body building, its body plant occupying an imposing unit of the big Pierce-Arrow factory at Buffalo. Many important developments in the body building field have come from this unit of the Pierce-Arrow Motor Car Co. but probably none more important than the new joint, which has now been used in manufacture for over a year, but which is announced publicly for the first time.

This improvement in body building, which has been called a "laminated joint," is used in all parts of the Pierce-Arrow body that are subjected to twisting and weaving strains. It is nearly two and one-half times as strong as the ordinary mortise and tenon joint, it is said.

During experiments conducted at the factory, a pressure of three and one-half tons was required to bend a Pierce-Arrow joint, measuring 2½x3 in.

News of All the Industry

Incorporations

Lime King Quarries, Bryan, Texas, $50,000. C. S. Gainer, M. E. Wallace and W. H. Lawrence.

Concrete Co., Inc., Clarksburg, W. Va., increased capital stock from $15,000 to $50,000.

Kentucky Rock Asphalt Co., Wilmington, Del., $13,804,000. (Corp. Trust Co. of America.)

Kremroy Washed Gravel Co., Cleveland, Ohio. $100,000. Fred Dethloff, W. E. Slabaugh, Regina Brannan and others.

Rockland Cement Block Co., Clarkston, N. Y., 100 shares common, no par. E. and J. H. Mulrain, J. C. Britton. (Attys., McKercher & Link, 40 Rector St., New York.)

Floral City Rock Mine Co., Floral City, Fla. Fred W. Bickman and R. M. Robinson.

Gulf Gypsum Co., Falfurias, Texas, $10,000. J. E. Wilson and L. N. Hopkins.

Johnson Marble & Granite Co., Greensboro, N. C., $50,000. C. C. Johnson, 520 West Gaston St., and others.

Hein Bros. Basalt Rock Co., Petaluma, Calif., $100,000. Jacob F. Hein, Mark Hein, Jessie L. Hein and Estella Hein.

Bell Marble Co., Bell, Calif., $15,000. John F. O'Neil of Bell, Timothy O'Neil of San Jose, Calif., Clara and Charles Coutts of Maywood, Calif.

Limestone Products Co., Menominee, Mich., increased capital stock from $150,000 to $250,000.

H. G. Fannin and E. S. Wefing, Apalachicola, Fla., $50,000. To mine and deal in sand and gravel.

Southwest Gravel Co., Pico, Calif. C. P. Sandefur and C. E. Denison.

Springfield Concrete Products Co., Springfield, Mo., $6,000. C. D. Cope, G. F. Baldwin and J. S. Williams.

Sasse Art Cement Co., New York, N. Y., $5,000. H. Lewis, J. Litwin and G. Tomanek. (Atty., F. X. Nazeter, 353 Fifth Ave., New York.)

Gager Lime Manufacturing Co., Sherwood, Tenn., $50,000. B., C. B. and J. M. Gager, C. H. Gamble and J. W. Brown.

American Pulverizing Co., Millville, N. J., $125,000. To prepare and deal in sand. J. Roy Oliver.

Sherman Cement Co., Hartford, Conn., $50,000. H. C. Rowe, H. T. and R. H. Sherman and R. J. Klingberg, all of New Britain, Conn.

West Penna Sand and Gravel Co., Wilmington, Del., $200,000. (Corp. Trust Co. of America.)

Sylvan Quarry Co., Portland, Ore., $1,500. A. Benz, O. Hoffman and others. Corr.: C. D. Christensen, Northwestern Bank Bldg., Portland.

Keystone Phosphate Co., Paris, Idaho., $750,000. F. S. Irwin, J. A. Wallis and G. M. Rudnick.

Quarries

Hiddenite Crushed Stone Co., Inc., Hiddenite, N. C., is planning additions of equipment to their plant which include a continuous belt conveyor, 200 ft. long, and a number of all-steel quarry cars.

Interstate Rock & Crusher Co., Kansas City, Mo., is to install additional equipment at its plant to consist of crushers, power equipment and steel cars.

Sand and Gravel

Risley Sand & Gravel Co., Dixon, Ill., suffered a severe loss when a 100-ft. steel mast, which was an integral part of the dragline excavation system, was blown down during a recent gale.

Macklin & Wolf have completed the installation of equipment and storage bins at their gravel plant near Sheffield, Ill. The plant will ship the product on barges up and down the Hennepin.

New Harmony Gravel Co., New Harmony, Ind., has put a new dredge, recently built, into service on the Wabash river.

Harrisburg, Ore., is the location of the new gravel plant to be erected by the Linn county commissioners. The new plant will have two crushers and operate on electric power.

Signal Mountain Portland Cement Co., Chattanooga, Tenn., is reported to have acquired a site 600x350 ft. along the river on which they will erect a sand and gravel plant.

Sonoma Gravel Co., Geyserville, Calif., has been purchased by L. E. Snead and C. R. Powell. Mr. Snead was manager of the company's plant near Healdsburg for a number of years. The Geyserville plant, located on the Russian river, will soon be shipping about 15 cars of gravel per day, it was announced.

H. J. Maginn, Sacramento, Calif., is to erect a sand plant on the Yuba river near Marysville, Calif. A spur from the Western Pacific railroad will be run to the plant.

James Braden has purchased the plant and holdings of the Central Gravel Co., Vasons Junction, Calif.

Cement

Canada Cement Co., Montreal, Can., has acquired the mining rights to a gypsum deposit located near Cranbrook, B. C. Mining operations are expected to be started shortly, present plans calling for the shipping of cars of raw gypsum each week to the company's cement plant at Exshaw, Alberta.

Federal Portland Cement Co., Buffalo, N. Y., has awarded the contract for the foundations for the buildings and machinery, together with the slurry tanks, to E. P. Muntz, Buffalo, N. Y. The track work will be done by H. F. Stimm, Buffalo; silos and pack house by the M. A. Long Co., Baltimore, Md., and the steel superstructure by the Lackawanna Steel Construction Co., Buffalo.

Egyptian Portland Cement Co., Port Huron, Mich., met with a loss of $50,000 through a recent fire at the plant.

Security Portland Cement Co., San Bernardino, Calif., has been reorganized and the plant at Devore will be enlarged to a daily capacity of 1,500 bbl.

Cement Products

Southern Coal & Supply Co., Savannah, Ga., has opened a plant at which cement roofing tile will be made. Three machines will be used and total capacity is expected to be about 1200 tile of various colors per day. Stewart E. Kraft is president of the new tile concern, and his partner, J. M. Harrell, is treasurer. O. C. Kirts is vice president.

Martin Cement Products Co., Hialeah, Fla., is planning the enlargement of the plant.

Southern Brick & Tile Co., Charlotte, N. C., has completed its stone-tile manufacturing plant in Charlotte and plans establishing like plants in Greensboro and Winston-Salem and another in Charlotte.

Missouri Hardstone Brick & Tile Co., St. Louis, Mo., has plans under way for the erection of a new cement products plant on a tract of land at Pacific, Mo., to consist of a main four-story building, 60x95 ft., and two one-story structures adjoining, 70x95 ft. and 40x70 ft., to cost close to $100,000, with machinery. It is expected to begin work at an early date.

Campbell-Whitaker Co., Miami, Fla., is to erect a cement block plant to cost about $10,000. Construction will be by the Truscon Steel Co., Youngstown, Ohio.

Houston Art Stone Co., Houston, Texas, is to erect a two-story building, 70x32 ft., adjoining their present plant. Electrically operated air compressors will be installed and other equipment so as to double the capacity of cast stone and ornamental plaster.

Stresbilt Tile Co., Alexandria, Va., has acquired the plant of the Arundel Shope Brick Co., Baltimore, Md., and will install machinery and equipment for the manufacture of cement tile, pressed cement brick, etc.

Cinder Block Corp., Baltimore, Md., is reported to be planning extensions to cost about $50,000 to their plant, which will double the present capacity of about 1,000,000 cement block per year.

A. B. Hughes, Elba, Ala., is reported to have acquired a site at Atmore, Ala., on which he will erect a cement products plant.

Lime

New England Lime Co. has awarded to Dwight P. Robinson & Co., New York, contract for design and construction of an extension to their plant at Adams, Mass.

Gypsum

Ebsary Gypsum Co., Inc., have consolidated their main office and sales offices into one general office at 414 Ogden St., Newark, N. J. The office at 103 Park Ave., New York, will still be retained to serve customers in Greater New York.

Standard Gypsum Co., Long Beach, Calif., has purchased the power schooner Nikko and will put her in service for handling small quantities of freight and supplies between the San Marcos Island workings and Guayaman, Mexico.

Silica Sand

Glacial Sand & Gravel Co., Zanesville, Ohio, have leased their silica sand plant at that place to the S. F. Spencer Sand Co., Dresden, Ohio.

Sand-Lime Brick

West Coast Brick Co., Sarasota, Fla., has purchased 200 acres of silica sand land in Hillsborough county, Florida, and will erect a sand lime brick plant with an initial capacity of 45,000 brick. The total cost is estimated at about $100,000.

Feldspar

Dominion Feldspar Corp.'s grinding mill at Rochester, N. Y., was damaged by recent fire. Loss to equipment and plant was set at about $80,000.

Eureka Flint & Spar Co., Trenton, N. J., has reorganized under the same name with a capital of $10,000,000 to take over and expand the present operations. The company operates several feldspar deposits and grinding mills.

Rock Asphalt

Kentucky Rock Asphalt Co., Louisville, Ky., was awarded the contract to furnish Breckinridge county, Pennsylvania, with 500 tons of rock asphalt. The price accepted was $10 per ton plus the freight rate, which amounts to $4.57 per ton, with a discount of 25 cents per ton if paid for within 10 days after the end of the month following shipment.

Personals

Rodman Wiley, of Billiter & Wiley, road contractors, has been elected vice-president of the Kentucky Rock Asphalt Co., Louisville, Ky.

Edward T. Slackford has joined the Buchen Co., Chicago advertising agency, in the copy and research departments. Mr. Slackford has been connected with the Marion Steam Shovel Co. for the past year as advertising manager.

Manufacturers

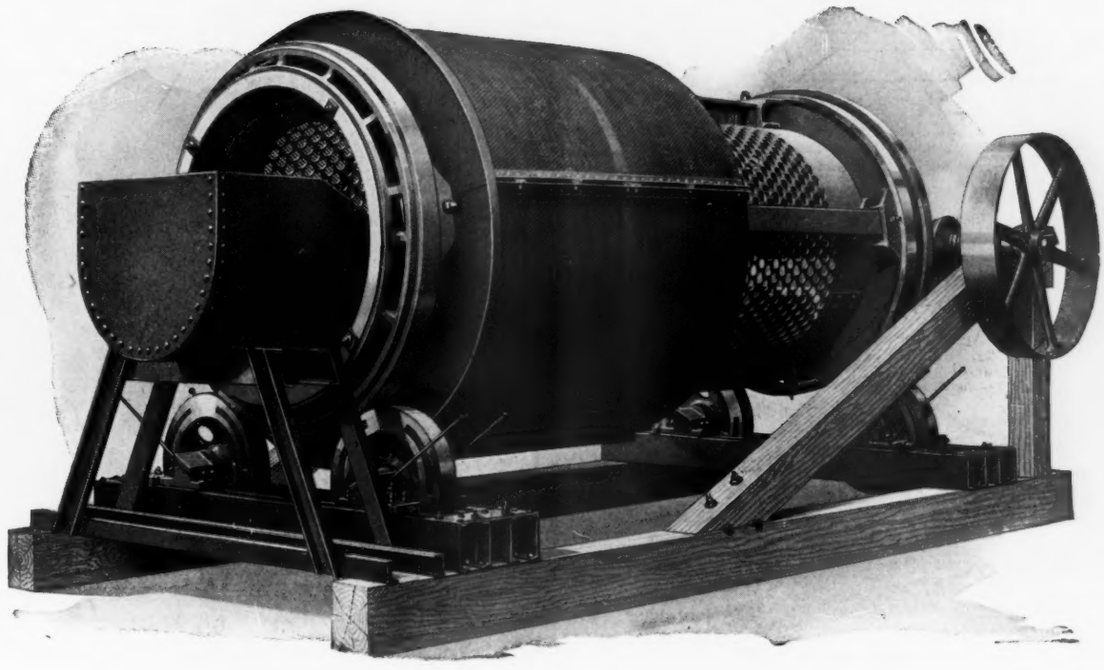
Uehling Instrument Co., Paterson, N. J., has appointed Henry Eggelhof, Dallas, Texas, representative for the eastern half of Texas.

Power Specialty Co., New York, N. Y., has purchased the Aero Pulverizer Co. and will continue the manufacture of the Aero unit coal pulverizer at their own shops. The Power Specialty Co. is now able to furnish purchasers of steam plant equipment with all the accessories needed for the complete power plant.

American Engineering Co., Philadelphia, announces the appointment of H. Kempner as sales manager of the electric hoist division. Mr. Kempner has been in charge of sales promotion work for the American Engineering Co., including the handling of their advertising and publicity, for the last three years.

Sullivan Machinery Co., Chicago, Ill., announces the appointment of Charles B. Officer, formerly assistant to the president on engineering matters, to the position of chief engineer of the company.

Screening Equipment



To meet the requirements of modern rock crushing plant operators, Allis-Chalmers have designed and successfully installed their Style "B" Open End Revolving Screens.

You will find the same rugged construction which characterizes all of Allis-Chalmers products thru a half century of experience. Allis-Chalmers screens will win for you in the long run. A complete line of screens including the "Allis-Chalmers Compensated Type Shaking Screens."

Let our engineers figure on your requirements
Write for estimates

ALLIS-CHALMERS PRODUCTS
Electrical Machinery
Steam Turbines
Steam Engines
Gas and Oil Engines
Hydraulic Turbines
Crushing and Cement Machinery
Mining Machinery

ALLIS-CHALMERS MANUFACTURING COMPANY

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Offices in All Principal Cities

ALLIS-CHALMERS PRODUCTS
Flour and Saw Mill Machinery
Power Transmission Machinery
Pumping Engines-Centrifugal Pumps
Steam and Electric Hoists
Air Compressors - Air Brakes
Agricultural Machinery
Condensers

Broderick & Bascom Rope Co., St. Louis, Mo., have issued a special number of their house organ, "The Yellow Strand," to commemorate the 50th anniversary of the company's existence. An interesting history of wire rope manufacture from the early days to the present modern methods is given. It contains also short biographical sketches of the founders of the company, present officials and the story of the great development of the company. It is well illustrated throughout.

Koppel Industrial Car and Equipment Co., Koppel, Penn., announces the appointment of A. K. Barner as district manager of the southern territory with offices in the Robert Fulton Bldg., Atlanta, Ga. Mr. Barner was formerly assistant sales manager of the company.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Power Shovels and Draglines. Bulletin **S-80** describing and illustrating different sizes and types of Erie shovels and draglines. Details of various parts, capacities, etc. 24 pp., 8½x11 in. ERIE STEAM SHOVEL CO., Erie, Penn.

Direct-Injection Oil Engines. Catalog illustrating and describing Ingersoll-Rand oil engines as used in railway, marine, industrial and other applications. Data and details of the **PO** type of 55, 110 and 150 b.h.p. sizes and illustrations of plant layouts, installation views, etc. 34 pp., 8½x11 in. INGERSOLL-RAND CO., New York.

Potentiometer Pyrometers. Catalog **87 E** illustrating and describing potentiometers for recording and controlling kiln temperatures. LEEDS & NORTHRUP CO., Philadelphia, Penn.

Wire Rope. Handbook on the use and care of wire rope in and out of service. Includes interesting details on lubrication methods, splicing, etc. Illustrated. 88 pp. AMERICAN CABLE CO., Chicago, Ill.

Adhesion of Gypsum Plaster to Various Backings

SPECIMEN slabs of concrete, plastered with 1:3 sanded gypsum plaster and aged for one year to determine if a loss of adhesion could be noted, have been tested by the bureau. The slabs were stored in the laboratory, where they were subjected to the temperature and humidity changes corresponding to a partition wall or ceiling. Two specimens have been tested, the method being the same as that used with the seven-day-old specimens.* The specimens were placed in an Olsen testing machine, of 55,000 lb. capacity, with the backing clamped securely to the movable platform and the mechanical device connected to the stationary platform. A gradually increasing load was then applied until the plaster pulled free of the backing. The following results were obtained:

Kind of backing	Adhesion (after 1 year) Lbs./in.	Factor of safety adhesion — weight plaster
Concrete (1:2:4) by volume	{ 14.8	350
	{ 16.7	400
Mean	15.8	375

The adhesion of 1:3 sanded gypsum plaster to concrete (1:2:4 by volume) after aging seven days was found to be 15.6 lb./in. Therefore, the above results would indicate that the adhesion does not decrease with age, as has been thought to be the case. However, it must be borne in mind that these specimens were not subjected to any great temperature or humidity changes, as might be found in most constructions. Neither were there any stresses nor strains brought to bear on the concrete, as would undoubtedly be the case under practical conditions. In some instances, where the failure of the bond between gypsum plaster and concrete has occurred, the method of application of the plaster and concrete has been a contributing factor. In the case of the above specimens the concrete was thoroughly cleaned and moistened before the plaster was applied. The surface of the concrete was slightly rough and of coarse texture, and therefore no backing was necessary. The moistened surface prevented too much suction and did not rob the plaster of the water necessary for the chemical reaction which causes the gypsum to set and harden.

*"The Adhesion of Gypsum Plaster to Various Backings," J. P. C. Peter, American Architect, Sept. 9, 1925.

Burning Lime with Low Grade Fuels*

The Gas Producer Offers the Best Method of Using Lignite, Wood Waste and Inferior Coals

By Prof. Gregor Kaplan

THERE have been many investigations reported in technical literature regarding the use of wood, peat and similar low thermal value combustibles for the burning of limestone. These fuels are not used as widely as good coal and coke and for this reason the results that can be obtained with them in the lime burning process are not so well known. On the other hand they are of considerable interest to those who are concerned with the technical end of the lime burning process.

It is known that there are two general types of kilns that are employed in the manufacture of quicklime, one the annular or ring shaped kiln and the other the more familiar shaft kiln.

The ring shaped or annular kiln is used in Germany with few exceptions in installations that produce large quantities of quicklime while the shaft kilns are employed for the smaller and medium sized installations, up to a maximum of 20,000 kilos (22 tons) per day.

In discussing the question whether an annular kiln or the shaft kiln is the best suited for a certain set of conditions, consideration must be given to the form and the size of the stone pieces that are to be burnt. Furthermore the grade of the limestone must also be taken into consideration.

For example, if the pieces of limestones are of such form that it is not convenient to burn them in the annular kiln, then the shaft kiln should be selected. Inasmuch as the burning of limestone in the annular kiln offers no particular difficulties and as the design and construction of the annular kiln are not different from that of the furnace used for burning coal, it is possible to use the annular furnaces that have been designed for coal burning directly without any change for the burning of wood. The burning process when carried out with wood offers special advantages, as the quicklime obtained is very pure and free from all ash or clinker. Because of this it is suitable for purposes which demand a very high grade product.

*Abstracted from the German *Tonindustrie*, 1925, p. 1149-50.

The burning with low grade lignite, coals or peat differs from that with wood only in the method that is employed for charging the limestone into the annular kiln. For burning of limestone with wood, the slag channel is approximately 40 cm. (16 in.) high, and in the case of low grade lignite and peat (because of the greater proportion of ash that is found in these fuels) it is made approximately 50 to 60 cm. (20 to 24 in.) deep.

However, the case is quite different when the burning is carried out in a shaft kiln. There are kilns of this type which are directly fired; that is, those in which the limestone is arranged in layers interspersed with the combustible, and there are also shaft kilns which are fired with gas.

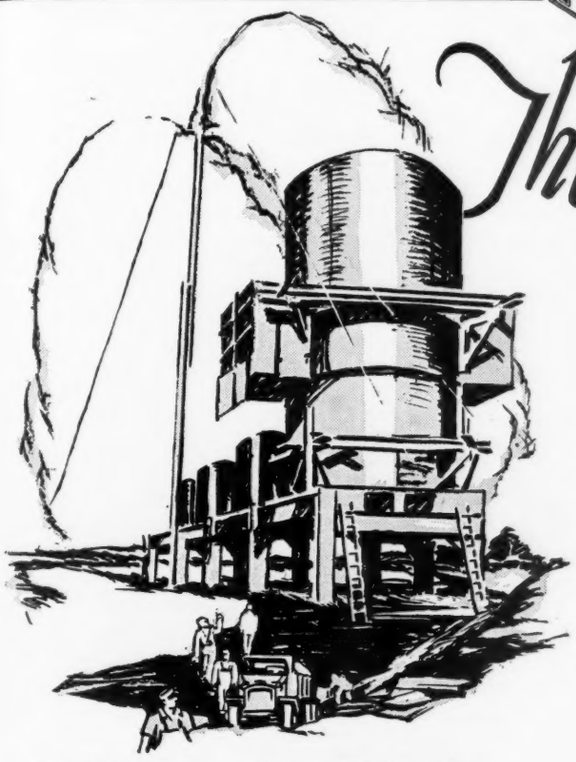
The first method of operating the kiln can be used only in the case where high grade combustibles are employed, and kilns of this type are entirely excluded for use with low grade fuels such as wood, low thermal value peats and lignite coals. In such cases it is best to employ shaft kilns which are fired by gas, which also give the best thermal results. There are no difficulties found at the present time in the construction of ring furnaces and shaft kilns which are provided with agitating grates for firing purposes. Every furnace builder is familiar with the proceedure which is followed in determining the dimensions of the furnace. It is only the shaft kiln which is fired with gas that is not viewed with favor in all circles and this is particularly because the construction of the apparatus and its operation are still fraught with difficulties which have not yet been entirely overcome.

There are two principal difficulties which stand in the way of the universal adoption of the gas fired shaft furnace, as follows:

1. The uniform distribution of the combustion gases around the circumference of the furnace and within the combustion space, and

2. The regulation of the draft during the burning process.

Before the author goes any further into the subject of the construction of the gas



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In accelerating to running speeds, Shays are 22 per cent faster. At spotting, Shays are 11 per cent quicker. On grades, too, Shays are speedier.

Actual experience can prove that Shays will improve your production and add to profits. May we explain the reasons why?

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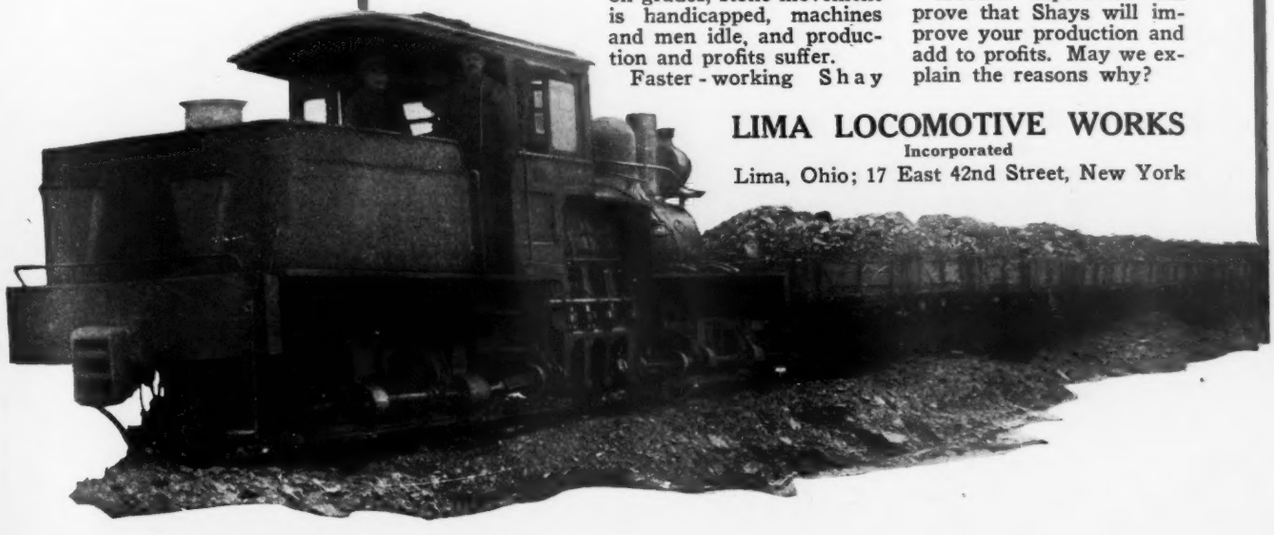


fired shaft kiln, he wishes to say something about the advantages of gas firing in general.

The principal advantage of the gas generator over the customary method of firing lies in the fact that the low thermal value combustibles, which because of their low content of heat values, cannot be burnt with efficiency in the furnace, are gasified on the other hand with considerable efficiency in the gas generator. The furnace does not in this case have to act as a gas producer and the gases that are generated from such fuel are not used for the most part at the point where they are produced but are burnt afterwards in the kiln. Thus, for example, this method of handling low thermal value fuels is particularly well suited to those that contain a considerable proportion of water, and which are known to give bad thermal results when burnt on the grate. In the generation of gas from such a fuel it is possible by cooling the gaseous product to cause the water contained in it to separate out, and thereafter the gas may be preheated in some suitable manner by means of the waste heat that is allowed to go to waste up the stack and after being admixed with air, which has likewise been preheated, it is burnt in the kiln. The results that are obtained in this manner are very effective both from the thermal and economic standpoints.

It is of course understood that the gas that is used in this process of firing limestone kilns must be mixed with air to burn. The air that is required for this purpose is introduced into the kiln at the proper point where the combustion is to take place. This air is known as "secondary air" in contradiction to the air that is used in the producer for the gasification of the fuel and the manufacture of a producer gas, which air is known as "primary air."

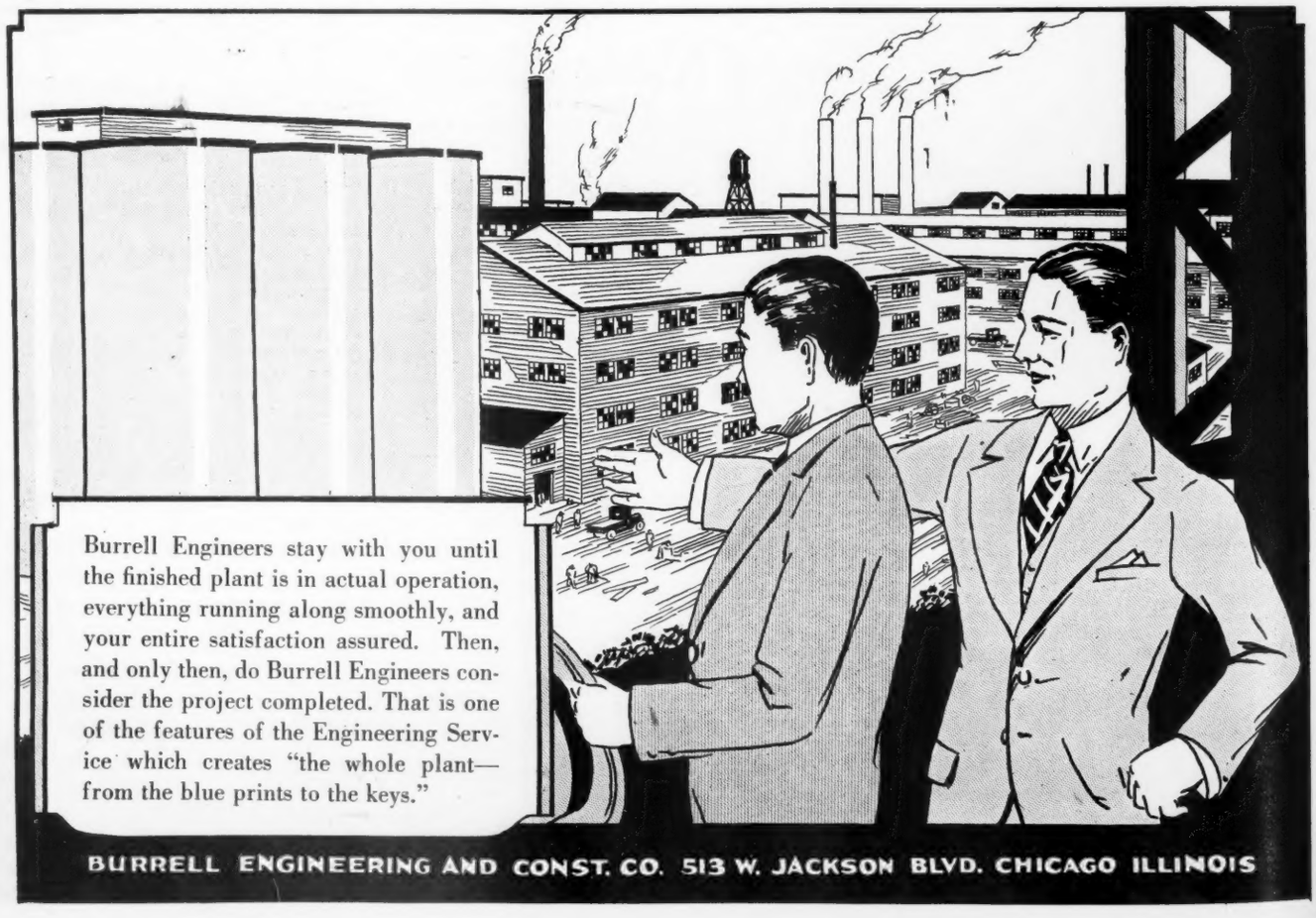
It must be emphasized again that an important advantage lies in the fact that the air that is employed for burning the gas can be preheated before being used for this purpose and in this manner the thermal efficiency of the operation is greatly increased, which is not possible with other methods of firing. The heat that is employed for this purpose comes from various sources, according to the nature of the furnace and of the products that are being manufactured or treated in it. In the case of the shaft kiln furnace used for the burning of lime, the heat that is contained in the burnt lime is utilized in heating up the air preliminary to its admixture with the gas and combustion. Thus the heat that is lost in the cooling of the burnt lime under ordinary conditions is made use of in this case to great advantage.

There is also another important advantage of using gas for the burning of limestone and that is that when the gaseous fuel is employed it is possible to carry out a complete combustion process without the need of a great excess of air. In fact, the amount of air used in excess is kept down to an absolute minimum. It is known that when other fuels than gas are burned, it is necessary to employ about twice as much air for the combustion as is required, according to theoretical considerations. In fact, it is often found that three and as high as five times the theoretically required air is used. It is of course understandable that combustion conditions in these cases are not very efficient and that the gaseous fuel can be burnt with a much greater efficiency.

Then again it is found that when solid fuel is employed the air does not mix so thoroughly with its products as when gaseous fuel is used. This also connotes greater efficiency in combustion. The result is a considerable saving in fuel.

It must also be remembered that the gaseous flame is a clean one, one that is free from ash, from dust and smoke. The result is that the quicklime that is manufactured under such conditions is unusually free from ash and clinker and is hence well suited for use in chemical manufacturing processes, where the requirements for a pure quicklime are very stringent, such as in the sugar industry. In generating gas it is possible to employ as fuel either hard coal, peat, wood, wood wastes and other low grade fuels.

(In the original article there is contained a discussion of the methods that are used in the construction and operation of a kiln which will burn gaseous fuel. It is known that there are comparatively few plants that use gaseous fuel. Nevertheless it is a fact that greater efficiency will be obtained with gaseous fuel, although this would necessitate the erection of a producer to make the gas. This is a subject which will acquire more importance as fuel becomes more expensive.)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